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FRULLI**

**LAVAGEM DE DINHEIRO E CONSEQUÊNCIAS
ECONÓMICAS DA TRANSIÇÃO PARA UMA
SOCIEDADE SEM DINHEIRO**

**MONEY LAUNDERING DEVELOPMENTS AND
ECONOMIC CONSEQUENCES OF A TRANSITION TO
A CASHLESS SOCIETY**



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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Economia (Dual Degree), realizada sob a orientação científica da Doutora Maria Elisabeth Teixeira Pereira e Rocha, Professor Auxiliar do Departamento de Economia, Gestão, Engenharia Industrial e Turismo da Universidade de Aveiro (Portugal) e do Doutor Mindaugas Butkus, Professor Auxiliar da Faculdade de Economia e Gestão da Vytautas Magnus University em Kaunas (Lituânia).

I dedicate this work to my niece Luna

o júri

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agradecimentos

This work aims to present a different point of view of money laundering, that, sometimes, has been more expensive fighting it than suffering it. The work comprises different traditional views of the problem, the economy, and the technology applications on the economy supported by an extensive literature review and an empirical application.

I am thankful to all the professors, responsible of exchanges, that gave me the opportunity to make this experience of two years of master degree in two universities in different countries from mine, so I had the possibility to know new places and new people. I want to say thanks to Professors Elisabeth Pereira and Mindaugas Butkus because even if it could not always be easy to work with me, but anyway they helped me and for that I am really thankful.

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palavras-chave

Lavagem de Dinheiro; Sistemas de Transação; Moeda Eletrónica; Economia Subterrânea; Comércio eletrónico.

resumo

Uma das maiores mudanças que se verifica nos nossos dias é na área das transações financeiras, onde estão a ser feitos esforços para que os pagamentos em dinheiro sejam substituídos completamente por pagamentos através de meios eletrónicos. Há muitos benefícios esperados para essa etapa, mas poucas são as evidências relatadas, principalmente no que diz respeito às repercussões sobre a lavagem de dinheiro e o crescimento económico. Neste trabalho, tem-se como objetivo investigar a relação entre o aumento do dinheiro eletrónico em detrimento da moeda fiduciária e a tendência de lavagem de dinheiro com uma análise geral subsequente do crescimento económico. Para compensar a quantidade limitada de dados que podem ser obtidos para um número diferente de países, será realizada uma análise composta por várias análises diferentes, examinando os efeitos da moeda eletrónica em alguns dos componentes da lavagem de dinheiro, garantindo, assim, a validade da análise. Os resultados obtidos confirmam algumas premissas anteriores, mas abrem caminho para novas questões, pois, se de alguma maneira, o dinheiro eletrónico está em desvantagem na lavagem de dinheiro, de outra forma, há novas oportunidades que também se abrem para potenciais criminosos.

keywords

Money Laundering; Transaction System; Electronic Money; Black Economy; E-commerce

abstract

One of the biggest revolutions we are witnessing is in the field of financial transactions, where efforts are being made to bring payments to a completely electronic way. There are many benefits expected from this step, but few are the evidence reported, especially as regards the repercussions on Money Laundering and Economic Growth. In this work, I want to investigate a relationship between the increase in electronic money at the expense of paper money with the trend of money laundering with subsequent overall analysis in economic growth. To compensate for the limited amount of data that can be obtained for a different number of countries, and analysis composed of several different analyzes will be carried out, examining the effects of electronic money on some of the components of money laundering. This ensures the validity of the analysis. It will be seen that the results found will confirm some previous assumptions but will open the way to new issues since if in some ways electronic money is at a disadvantage of money laundering, in other ways, there are new opportunities that open up also for potential criminals.

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List of Acronyms

AML – Anti-Money Laundering
BOE – Bank of England
BRICS – Brazil Russia India China and South Africa
ECB – European Central Bank
ECOLEF – Economic and Legal Effectiveness of Anti-Money Laundering
EMV – Europay, Mastercard and Visa
EU – European Union
FATF – Financial Action Task Force
FE – Fixed Effect model
FSS – Financial Software and Systems
GAFILAT – Grupo de Acción Financiera de Latinoamérica
GDP – Gross Domestic Product
IMF – International Monetary Fund
KYC – Know Your Customer
MENA – Middle East North Africa
MIMIC – Multiple Indicator Multiple Causes Model
ML – Money Laundering
NPCI – National Payments Corporation of India
OECD – Organization for Economic Co-operation and Development
OLS – Ordinary Least Squares
PSD2 – Payment Service Direct 2
RBA – Reserve Bank of Australia
RBI – Reserve Bank of India
SARB – South African Reserve Bank
SEPA – Single Euro Payments Area
UK – United Kingdom
UNODC – United Nations Office on Drugs and Crimes
UPI – Unified Payments Interface
US – United States
USA – United States of America

1 Introduction

Revolutions, in whatever field they occur, always involve other fields as well. The technological revolution of the 21st century marked a turning point in terms of production, efficiency, optimization of almost every type of human action, from logistics to distribution, and others. The economic-financial and monetary world has also been hugely influenced by this technological development, which tends to make everything electronic or digital. In fact, at the end of the twentieth century, cash began to step aside to gradually make room for money in the form of electronic cards before evolving into "virtual" coins, in 2009. As electronic money has acquired liquidity preferences, its uses have also been increasingly taken into consideration, trying to ensure that electronic money could perform almost all the functions of money including the historical performed property of liquidity.

Therefore, the 2000s showed a strong attempt at change and a radical change in our system of transactions, concentrating, in most developed countries, the transition to an electronic way to manage all ordinary expenses, from the lowest to the most important (Bolt, Humphrey, Uittenbogaard, 2008).

In a period, therefore, characterized by upheavals such as the creation of the Euro currency or occurrence of the economic crisis of 2008, illicit activities take advantage of it, thus feeding a market that sometimes it is not remembered to exist, but exists and its value is immense: the underground economy.

In the Internet age, globalization and a world in which political balances are increasingly threatened, among other things, also by new terrorist organizations, therefore more attention is paid to the evolution of the economic reality that every day registers the movement of huge capitals from one side to the other of the globe. But the question arises: where do these capitals come from and where do they go? In addition to the regulated markets which are constantly monitored by the competent authorities, there are illegal "markets", that is, those uncontrolled ones in which sums of money from criminal activities are exchanged. Most of the illegal profits derived from the activities managed by the mafias such as drug dealing, exploitation of prostitution, exploitation of illegal immigration, management of gambling halls, creation of "ghost" enterprises and all those activities which by their nature constitute a crime (Naselli, 2017)

Among the various reasons for the alleged shift towards an economy without cash, therefore, such as the ease and the most comfortable portfolio management, one of the most important is need to stop, or at least limit the as soon as possible, the illegal activity of money laundering, the main part and driving force behind the so-called "shadow economy". In short,

the goal is to fight the black market by eliminating its largest size, historically, liquidity. Several countries are mobilizing towards the abandonment of paper money.

According to a report from the Copenhagen School of Economics, Sweden will be completely cashless in 2023 (Arvidsson & Hedman, 2017). By the way, this is only the last of the many steps that have characterized the evolution of money towards a total electronic version of that. Alongside it, other countries are trying to move towards a fully electronic transaction company, such as Denmark, Switzerland, and other countries have also made various attempts in this direction, such as China, India, also resorting to the new digital currencies that are developed in the world market in the last ten 10 years, like Bitcoin, which guarantees transactions with anonymity and without the need for an intermediary.

As already mentioned, one hoped (and also expect) the effect of this step is the reduction of money laundering and the shadow economy. But somehow, there are reasons to believe that this transition does not have such a direct and strong impact or, better, it is not so immediate to think of a decrease in money laundering caused by the adoption of electronic money. Furthermore, it is not entirely certain that, from an economic point of view, a move to a cashless society has been beneficial. If therefore, this shift generates no benefits neither for money laundering nor for the economy, it could seem useless.

In fact, from an economic point of view, it seems that some countries with less rigid financial rules have somehow gained advantages from money laundering (Patel & Takkar, 2012), even if these advantages when they exist, should not be considered as a permanent benefit that is safe because they are often based on fictitious facts and economically non-solid outputs. Furthermore, from a functional point of view, it is essential to keep in mind, in fact, that in step with the times it is not only the "evident" world, because even crime knows how to exploit, often very well, the opportunities offered by technological development.

According to these assumptions, therefore, the purpose of this work is to investigate the existence of an impact of cashless society on money laundering. However, the relationship may also be bilateral, thus being a correlation, but I aim to investigate the effect that moving to a cashless company has on money laundering. Subsequently, whether the impact is present or absent, the overall effect of this shift on the economy, in general, will be studied, also considering the alleged positive effect that money laundering could have had on the economy of some countries. The empirical part of the present master thesis is implemented using the GRETL econometric software.

Through the implementation of this study, I want to find or, at least, to estimate an effect that the shift in cashless societies, that seems to be for some a certain future, has to the economy, focusing also in the effect on money laundering, supposing its influence on the economic growth. That's a topic that seems to be not faced yet, while there are discussions

about the positive and negative effects of abandoning cash, without empirical analysis (that are, by the way, difficult because of the natural lack of data).

Anyway, it's not possible talking about outcomes on crime to be sure about those, because currently, the launderers are in a new age of money laundering, based already on technology: the so-called electronic money laundering or, better, transaction's laundering. Criminals are already started to use that, indeed *"Transaction Laundering for the online sales of products and services reaches over an estimated \$200 billion a year in the US alone. Of this, \$6 billion involves illicit goods"* (Teicher, 2018), and some electronic items for payments are already used as a means for money laundering. *"Indeed electronic payments systems would enhance their suitability for the whole money laundering process – prepaid cards for the placement phase, mobile payment system for the layering phase and virtual gold currencies for the integration phase (...) Money laundering is a complex and continuously changing process"* (Woda, 2006:46)

Through various approximations, it will be attempted an empirical analysis of the developments brought by the switch with electronic transactions on the economy and on the evolution of money laundering and so an estimation about the outcomes on economics will be done. Approximations are, by the way, necessary because the main feature of the "shadow economy", is not regulated, is the lack of data that is, by the way, what keeps it alive; useless to say that a full availability of data regarding shadow economy and its effect on the economy would cause an immediate contrast on it and, hoping, its end. So, an electronic society has, as consequences, more transparency because of the traceability of transactions.

Money laundering is a phenomenon affecting the economy from different points of view and with no good consequences. So, governments from all over the world need to fight it.

Moreover, in different countries, a transition to a cashless society is aimed for the next years, and in general, the future seems to be without cash. I said already that One of the reasons for this choice is the advantages that seem to be for the fight against money laundering. But what does it mean a society without cash and which consequences could have on money laundering and to economic growth? Moreover, it seems that some countries developed, in the period of highest growth, also through some illicit activity of washing money. Shifting to a cashless society could have still a stronger impact on economic growth too.

In this work, I will estimate the effect of this movement toward electronic transactions using data from the countries most oriented to this change and those that show already a high level of electronic transactions on economic growth and money laundering. Comparing these effects, I will analyze the convenience or less of this shift.

All of these will be discussed in the *corpus* of the thesis and it will constitute the main topic of it. In order to give an ordered and clear work, its steps are summarized here:

After this Introduction, in chapter 2, a synthetic description of the main concepts studied under the present thesis. After, also an analysis of the contingent positive effect of this illegal activity on the economy is analyzed, considering previous papers, articles, and works that already collected and analyzed data. Some of the determinants of Money Laundering will be shown here and they will be really important for the analysis. The chapter will be completed with the evolution of the money laundering. are presented the eventual effects given by money laundering, I move to talk about some measures to prevent and face it, i.e. I move to talk about the move toward cashless society; presenting different points of view from different countries, I will try to collect the necessary information to justify the choice of data regarding electronic money. As said already, various authors and various organizations already informed about advantages given by this shift, like the traceability of transactions that should make it easier to catch launderers. But some problems arise, regarding the growth of the country due to the inability of the population to adapt such a big shift (UKessay,2018). After grounding the hypothesis, the methodology of the analysis will be presented and the data selected as well.

Are analyzed, so, in the coming work, based on a literature review of, the effects of the development of cash in the last years, going through the cashless society. So, first are seen, in the next chapter, backgrounds about the effect of money laundering in the economy and the evolution of money laundering through the technological way.

In chapter 3 it will be grounded the selection criteria of data, making first an overview of the countries that are more involved in the shift to a cashless society and the means to do that. So, the data selection will be made based on the literature review of chapter 2 and partially 3.

The method, grounded in chapter 3, with the selection of data is implemented in chapter 4, based on the hypothesis of the Multiple Indicator Multiple Causes Model (MIMIC) model, according to which, an unobservable variable can be estimated with those indicators seen as a determinant of that. In my work, using the Fixed Effect method for Panel data, a relation between the indicator considered as a determinant, and indicators regarding the incentives for e-money will be analyzed. Besides the theoretical ground, the determinants will be checked twice with the indicator for Money Laundering (ML) one directly, in estimation with ML as variable Y and the determinants as X variables and one indirect, checking if the effect of E-money on ML is coherent with the effect found for E-money to the determinants of ML.

Then, in chapter 5, will be explained the results of the statistical analysis, through the use of the software GRETL, of the relation, if there is, first between electronic money and money laundering and after between electronic money and economic growth. Due to the limited

amount of data for this kind topic, the different analyses will be implemented, choosing each time a different dependent variable among the indicators chosen as a determinant of money laundering or shadow economy. Results are showed in the GRETL outcome, then synthesized in a table and explained.

2 Literature Review

2.1 Black economy: a cancer to economic growth?

The underground economy has already been the object of several studies on literature. If it is true that now the shared thought is that this economy, with all the illegal activities that are part of it, among which the role of money laundering stands out, is damage to economic growth, some authors have studied and also found situations where states benefited from the presence of these illegal activities. On the other hand, a flow of money, legal or illegal, always involves an employer and a borrower, in a nutshell, the money that starts on one side ends on the other side. And while it is true that the shadow economy and money laundering damage market competition, the same goes for the role of individual states in international markets. It will be show later that, therefore, the countries located in different parts of the globe, Africa, the Middle East, America and Asia, and even Europe have favored or, if desired, exercised too weak control over this type of activity. In this way they have favored countries in those parts of the world, attracting foreign cash flows which were then rejected in sectors of other states such as construction and the entertainment sector, such as sports (Galullo & Mincuzzi, 2019). Advantages for one country equate to disadvantages for other countries (Mincuzzi, 2016)

But how can be defined Money Laundering and, after many years challenging this phenomenon, which are the consequences on economic growth and how to face this criminal phenomenon? Money Laundering is defined as "*Money laundering is a process conducted through the use of financial transactions to disguise the origins of large sums of money.*" (Seymour, 2008: 3), so the ability to show legality about a certain amount of money whose source breaks the law. More often, also, money laundering is directly linked with others among the most known economic frauds, such as tax evasion and corruption (Storm, 2013). This is because that often, the money "stolen" from the government and hide from fiscal control, need to be "washed", and more often this money is used as the bride to corrupt, sometimes also for who should "control" the spread of this phenomenon; this phenomenon of tax evasion usually involve different countries because the money, indeed, are often sent to foreign private banks of the so-called "tax haven" (Storm, 2013)

Besides, there are also many markets located in the Middle East and North Africa (MENA) region that have found themselves subjected to significant restrictions and penalties for commercial and financial activities.

Thus, the populations that, consequently, are excluded from the global market as they lack infrastructure and or other means of involvement, will meet their needs by making trade exchanges and commercial partnerships with other jurisdictions that have a different system of

imposing sanctions or those use currencies that are not traditional leaders in a cross-border settlement. It is in this way, therefore, that the black market, as well as the gray one, can emerge as reactions to these restrictions (Worldwide, Global Payments Report, 2020)

2.2 How “hide” is the shadow economy?

The underground economy is related to an unregulated economy totally different and disconnected from the licit economy. But the underground economy has enormous consequences on the open economy. Most of the more common sense sees the black economy having a negative influence on the licit economy, because of its effect on the natural development of competition, taxes, and the loss of jobs. Furthermore, the underground economy was estimated, with all limits, by the International Monetary Fund (IMF) with a value of approximately 3.6% of world Gross Domestic Product (GDP) with 2.7% recycled¹, given that United Nations Office of Drugs and Crime (UNODC) has estimated between 2 and 5% of world GDP, 800 billion - \$ 2 trillion in the current United State of America (USA) dollars².

In figure 1, 2 and 3 is shown different features of shadow economy; in figure 1 is possible to see the size of the shadow economy in different European countries; in figure 2 the size of the shadow economy in countries that are developing and in already developed countries, showing a big difference between them; in figure 3 is shown the amount of shadow economy for European Union in terms of GDP.

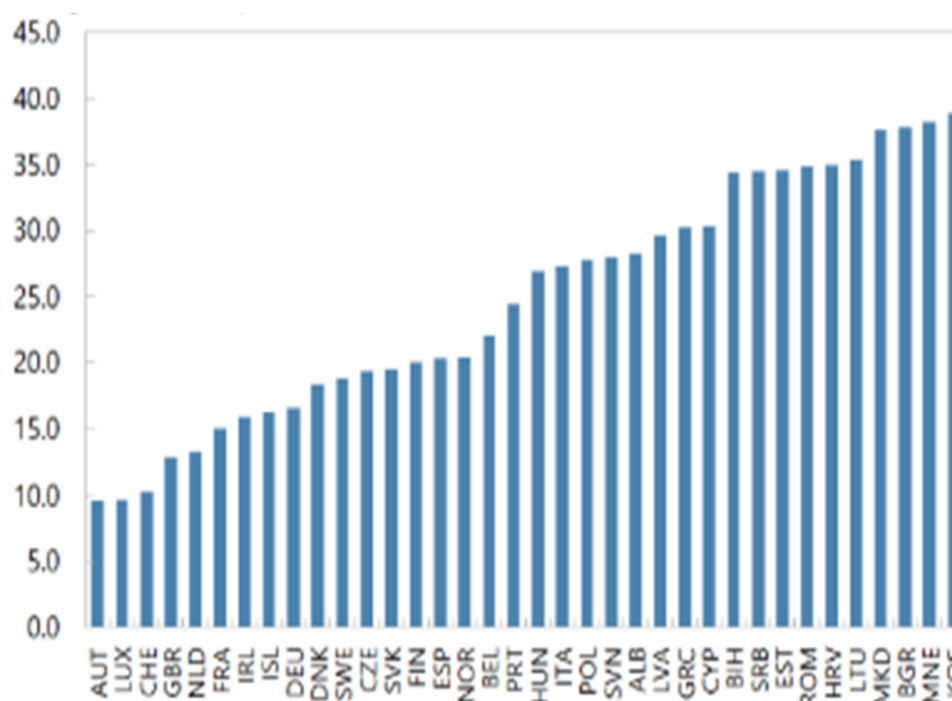


Figure 1: Size of shadow economy in European Union, 2016 (Source: IMF)

¹ <https://www.fatf-gafi.org/faq/moneylaundering/>

² <https://www.unodc.org/unodc>money-laundering>globalization>

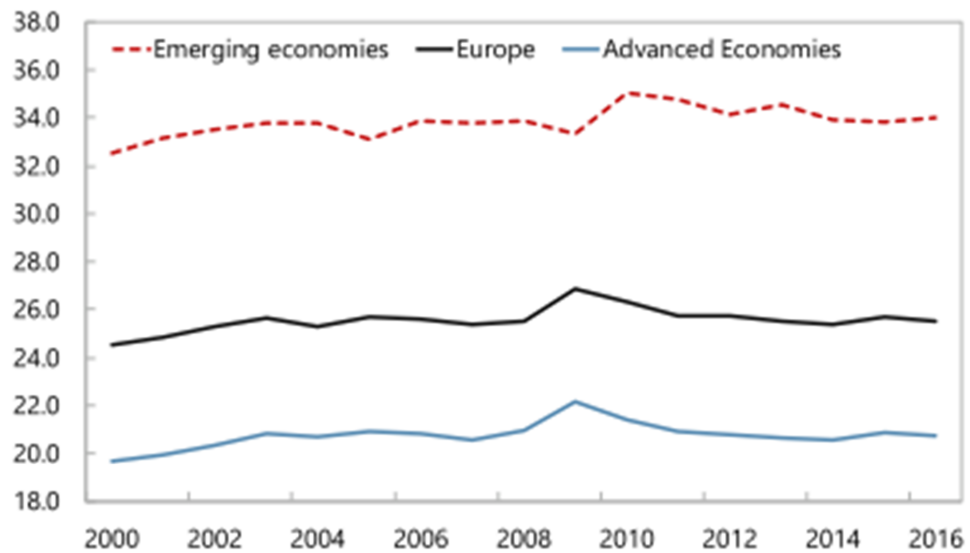


Figure 2: Size of shadow economy for different countries 2000-2016 (Source: IMF)

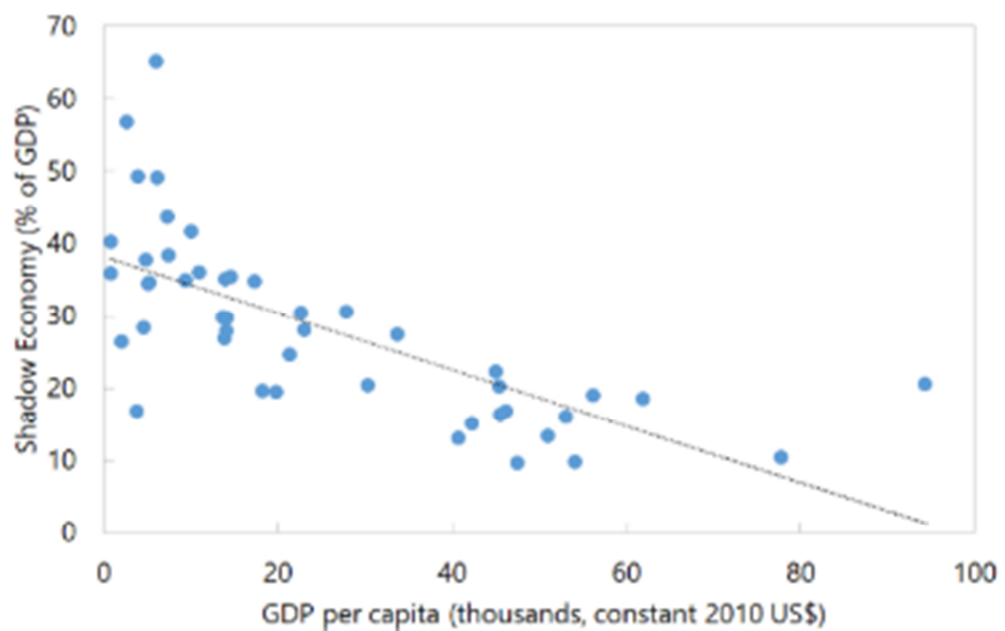


Figure 3 : Shadow economy and GDP per capita, 2016, (source: IMF)

2.3 How does money laundering work?

There are many ways in which money is laundered, criminals all over the world take advantage of every possible opportunity to launder money obtained from illegal activities such as drug trafficking, illegal trafficking, in the worst case, but also tax evasion or financial fraud, with donations, bribes, participation in auctions, setting up in sports clubs, tenders and in various other ways (Galullo & Mincuzzi, 2019). Furthermore, with the advent of digitalization, which has allowed almost globalization, the opportunities for recycling have multiplied. However, essentially the money laundering process is divided into three phases, now also confirmed by the literature: the placement or immersion phase, the stratification phase, and the integration phase (Lombardi, 2018; Galullo & Mincuzzi, 2019).

2.3.1 Placement or immersion phase

Placement or immersion phase means. the phase in which the capital deriving from illegal activities is introduced into the market and automatically transformed into active balances through the help of financial institutions and intermediaries (Naselli, 2017), To do this, deposits, exchanges, purchases of financial instruments, or money transfer operations must be made in order to obtain "structural money" to obtain recognition of the relationship with the financial intermediary and local suspects (Sales, 2019). Due to the limits on money that can be managed established in some countries, to discourage illegal operations, the subjects involved in the placement phase implement a strategy called smurfing, which consists of diversification and it's clearly illustrated in Figure 4.

In fact, this procedure allows you to move large sums simultaneously but without being reported. Indeed, payments are divided by opening a series of bank accounts at the same branch or multiple branches, to diversify the channels through which to achieve the gradual legitimization of the money. These transactions can be favored mainly by banks, financial intermediaries, traders, or professionals (Lombardi, 2018).



Figure 4 : How Money Laundering Works (Source: Smurfing, Howstuffworks.com)

2.3.2 Layering stage

The layering stage consists of the cancellation of any link between the recycled funds and the criminal activity from which they originate. This phase aims to prepare adequate coverage to legitimize the origin and membership of illegal resources. The processors, the so-called laundrymen, carry out a number of different financial transactions, some to convert them into money and then invest it again in financial instruments, to make traceability more difficult. The aim is to obtain the maximum degree of qualitative and quantitative diversification of risk. Stratification operations are often sophisticated and complex in that they are performed in international fund transfers, corporate transactions in offshore countries, simulated transactions (Galullo & Mincuzzi., 2019). All these operations have the purpose of avoiding any investigation, so as to lose the documentary traces that can be traced back to the illegal origin of the funds (paper trace). This leads to the accumulation and overlap of real layers of documentation which make the correct reconstruction of movements more difficult (Naselli, 2017).

2.3.3 Integration stage

This is the final phase, the money coming from criminal activities is completely integrated into the legal circuit to be "cleaned up" and reusable. Often are reused, for example, through investment in various sectors such as real estate, commercial, financial, entertainment, and industrial using forename. This is the most important to monitor because observing as through this it is possible to understand the great variety of techniques with which money is reinvested makes this phase the in-depth how the choices vary from one criminal association to another. Criminal structures act according to criteria of entrepreneurial rationality, directing capital towards reinvestment, which is at the same time a condition of development and survival of the so-called criminal economies. Failure to adequately monitor possible suspicious transactions in the vicinity of integration into the legal capital circuit undoubtedly implies the future impossibility of tracing the criminal origin of capital (Lombardi, 2018). All the process is illustrated in figure 5.



Figure 5 : How Money Laundering Works – Stages, HowStuffWorks.com

2.4 The problem of estimation and collecting data about shadow economics

Concerning the estimations of data on the shadow economy, it is not possible to talk about the limits that arise. First of all, just the name “shadow” suggests that there are not so many clear data about it, otherwise it wouldn’t be “shadow”. So, many times it is necessary to review or make approximations of what has to be observed because a lack of data or information can occur for this topic. Also, sometimes it’s possible to trust confident articles, works, and papers previously made.

Anyway, as already said, the shadow economy has been estimated, with all the limits, by IMF with a value for around 3,6% of the world GDP, while previously the most update data estimated ML with a value in a range from 2 to 5% of world GDP (UNODC, 2010).

In the first months of 2020, an article by Repubblica.it (the main newspaper of Italy) (Occorsio, 2020) has estimated an increase of the value of this hidden economy that now should have doubled the value in ten years

According to data gathered by The Economic and Legal Effectiveness of Anti-Money Laundering (ECOLEF) and reported by the European Parliament (2017), the United Kingdom is ranked first for laundering with 282 billion Euro, followed by France, Belgium, Germany,

Luxembourg, and the Netherlands. Of the \$7,8 trillion of global wealth offshore, Europe keeps \$3 trillion, followed by Asia Pacific (\$1,8 trillion) and, Middle East and Africa (\$1,4 trillion) (Lombardi, 2018). In figure 6 are illustrated the determinants of Shadow Economy according to Kelmanson (2019).

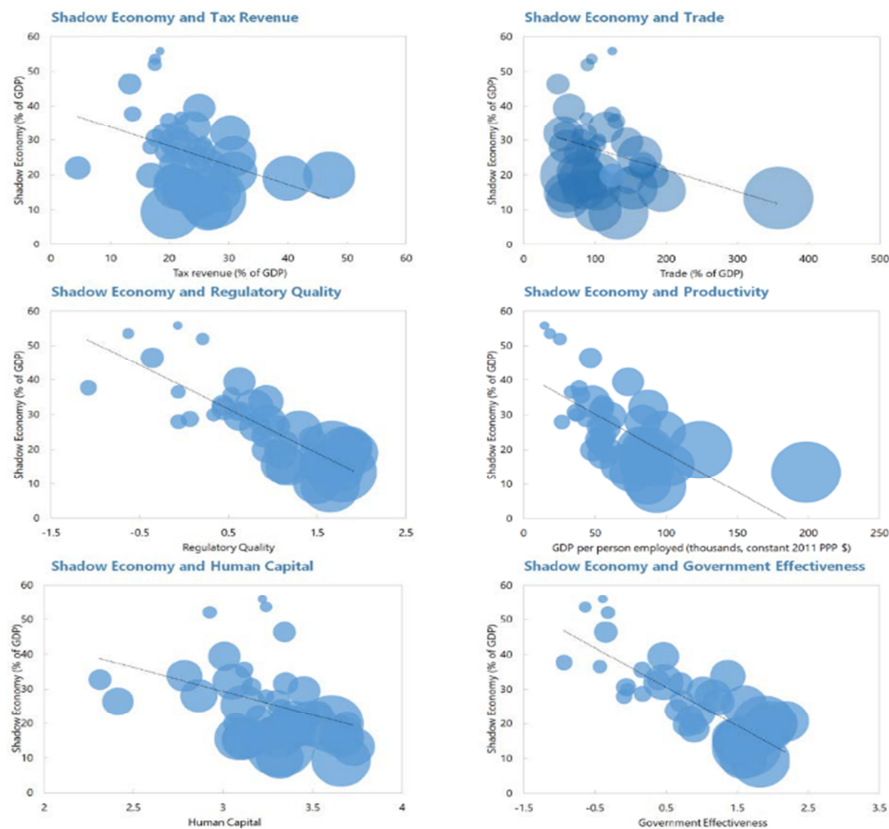


Figure 6 : Relations between shadow economy and its determinants(Source: Kelmanson *et al.*, 2019: 9)

Two main determinants can be used as a shadow economy, according to two authors (Perry, 2007; Oviedo 2009): (i) "exit" factors and (ii) "exclusion" factors (Kelmanson, Kirabaeva, Mircheva, Medina & Weiss, 2019). The so-called "exit" factors from the formal economy are all those factors that favor the emergence of voluntary informal employment. The so-called "shadow" workers generally have a similar (or even higher) gain than those obtained by workers of the formal economy; besides, shadow workers can enjoy greater flexibility at the employment level.

Otherwise, on the other hand, the so-called "exclusion" factors from the formal economy can cause a detachment from formal employment favoring the informal one; in this case, the worker is "forced" to move towards this path of informality, when and why he is unable to find a formal job. The main difference between the two is given by whether the workers have more satisfaction in carrying out formal or informal work. In a large part of states, however, both groups of factors are present (Kelmanson *et al.*, 2019).

Factors included in the exit ones are those that limited or, somehow, obstacle the entrance on the world of work for people, so are in general those that regulate the job market, such as burdensome and costly regulation, like also high entry costs, trade barriers; high and complex taxation system; heavy bureaucracy, administrative barriers, corruption; etc, all features that bring low benefits of being formally employed or formally registered, show a low quality of public goods and services (infrastructure, social protection), influencing negatively the trust on the government so inducing the individual preference for self-employment (Kelmanson *et al.*, 2019; Schneider, 2000). These indicators will be applied to the analysis implemented in chapter 3.

For factors of exclusion, it's meant those factors that make the individual, according to the standards of society and the will of the employer, not "enough" for a certain workplace. These factors can include, again, costly regulation, trade barriers, but also for the social demographic situation of the country, that sometimes limits opportunities for who is at the extreme of his career, like youngers and oldest, or some specific ethnic group; but low productivity can cause the exclusion of workers (Schneider, 2000). This is according to what is said by Kelmanson *et al* (2019:11) *"Where an informal activity is driven more by "exclusion" factors, workers tend to rely on their jobs to provide their income subsistence. Those workers typically have fewer skills, less education, and are less productive."*

In countries with a strong shadow economy presence, innovation and productivity are factors that suffer a lot. In this, the accumulation of human capital and entrepreneurial talent is not adequately valued (Kelmanson *et al.*, 2019).

According to Kelmanson *et al* (2019), there are various factors that are considered drivers of the developments of the dark economy, like for example a low quality of institutions, that have been found determinant (Kelmanson *et al*, 2019). An excessive regulatory burden moreover, or the inefficiency of government institutions, such as the weak rule of law and corruption can have negative effects on formal enterprises for hiring workers and can, therefore, encourage informal activities. It's in this view that regulatory burden has been always seen as the most robust cause of informality, because of its effect of suppression on entrepreneurial freedom, increasing costs, and bureaucracy issues (Dabla-Norris, Gradstein & Inchauste 2008). These indicators will be also considered for empirical analysis.

The tax burden, as well as the tax administration, are other important factors in explaining and defining the size of the shadow economy. Indeed, it has been shown that in countries with a higher tax burden (and usually less monitoring and enforcement), there is also a greater incentive for tax evasion. (Schneider & Williams 2013; Hassan & Schneider 2016).

According to Porta and Shleifer (2008) countries with higher productivity usually have a smaller informal sector because they do better the allocation of resources.

2.5 The effect of money laundering on the economy: previous opinions

Money laundering consists in the replacement or transfer of money, goods, or other utilities deriving from criminal activities, or in carrying out other operations in relation to them in order to hinder the possibility of identifying their illicit origin Financial Action Task Force (FATF). If at a global size, the United Nations Office of Drugs and Crimes estimates that dirty money moves between 3 and 5% of the planet's GDP, equal to a figure that fluctuates between 600 and 1500 billion dollars³. In Italy, for example, according to Naselli in 2017, the laundering of illicit proceeds produced 410 million euros every day, 17 million per hour, 285 thousand euros per minute, 4750 euros per second; according to the author, it alone accounts for 22% of total Italian GDP (Naselli, 2017).

Attacking illicit assets through seizure and confiscation has become of primary interest for most states, whose competent authorities conduct thousands of investigations every day to stop criminal flows. The theme of the seizure and confiscation of illicit assets, running along the dual track of prevention and criminal trial, identifies a double and significant moment of potential destabilization of the economic structure of criminal organizations.

“Money laundering gives rise to a series of transnational criminal activities and has reached a level of globalization equal to that of the financial market, of which it uses the channels for the conservation and increase of the wealth of illicit origin..” Moreover, *“.. Over the years, the techniques used in the integration phase have changed, both due to the need for diversification to divert the authorities, and because with the advent of information technology, it has been possible to cross over into cutting-edge sectors. It should be emphasized that the possibilities that today open up to the transfer of capital and therefore to recycling, are added to the traditional ones without replacing them.”* (Patel & Thakkar, 2012: 10). The difficulties, also in economic terms, have increased.

Taking it into account, my purpose in this chapter is to show a different view of the shadow economy for the real economy, especially talking about the money laundering and the effects on the growth of some countries that gained “benefits” from it.

This work, anyway, doesn't aim to give a "positive" view of money laundering and so it doesn't mean to justify in any way this particular negative behavior. Emerged, anyway, that some countries take advantage through this illicit mean, it simply wants to make sure that those positive relationships have existed and that some countries used in this way got illicit advantages, in terms of physic funds entering the country and so having consequences on it.

³ <https://www.fatf-gafi.org/faq/moneylaundering/>

So, in this chapter it will be discussed this topic defending it with the use of some previous researches; it will be a work based on secondary data analysis on previous works regarding that.

The starting point of the present analysis is the negative impact, socio-economic, that money laundering has on society. That is what is shared by most scientists and what is natural to think. The natural game of the concurrence is damaged with illicit funds that can advantage some firms rather than others that are acting in a licit way (Fabris, 2019). But from a strictly economic perspective, money laundering has represented for some countries a source of funds, where other sources were not available.

So, while on the one hand, the benefits seem an immediate consequence of the elimination of money laundering, on the other one cannot be sure that it will have "positive" effects in terms of GDP and development of a country. Nearly 5% of global "hidden" money GDP, according to the literature, should have a negative impact on growth. This negative impact from the competition consequences of money laundering is (and hopefully) supposed to be damaged by the move to electronic payments; without money, in fact, most criminal activities, such as drug trafficking and illegal trafficking among others, could slow down, since most of them are still paid in cash. This would damage the shadow economy, which will lead to an increase in public revenues, with the result of strengthening fiscal stability (Fabris, 2019). *"Most shadow economy trading today includes unreported transactions that would otherwise be taxed. With the transition to a cashless company, these transactions would enter legal flows and be subject to taxation. This could lead to an increase in public revenues, with the domino effect of reducing the fiscal deficit and public debt."* (Fabris, 2019: 5). Furthermore, due to its direct link with the tax offense and corruption, positive consequences could also be found in these sectors. *"The elimination of cash can seriously compromise criminal activity, especially those related to drugs and money laundering. These activities can hardly be done without cash. In addition, cash cannot be tracked, which is very useful for criminals. The move to cashless society could also make counterfeiting of money practically impossible, according to some previous authors"* (Fabris, 2019: 5).

2.5.1 Gulf countries case study

But not all have the same opinion, indeed even if it is auspicated an improvement of the economy with defeating shadow economics and money laundering the past, the criminalization of money laundering and so acts against it has shown, also, a negative impact on real GDP, sometimes, with a slowdown, showing as some countries performed better with an amount of the economy made by washed money (Fakhri, 2016). The same authors, by the way, found opposite evidence for different countries of the same area, i.e. Gulf Countries, so that,

some countries of that area (Kuwait, Bahrain, and Saudi Arabia) saw, by criminalizing money laundering, a slow down to their growth and other (Oman, Qatar, and United Arab Emirates) experienced an increase.

The working paper was based on the hypothesis that the preventions have taken against illicit financing activities such as money laundering increase the prosperity and the economic growth of a country.

"In the third case when the explained variable is suspicious transaction report we notice that this law (against money laundering) had negative effects on GDP meaning that in the past, GDP was, in part, constructed, even partially, by illicit money. So with the adoption of this law, the GDP decreases and a partial part of illicit money have changed destination" (Frakhri, 2016: 18)

That is the first example of the direct positive effect that money laundering has on the growth of some countries. Those are, anyway, all similar countries so other factors could influence this.

Anyway, also middle-south American countries could have gained from a source of "dirty money"; but, also, there are some European countries that are known as tax heavens, such as Switzerland and Cyprus and they could have had benefits from those sources of foreign capitals in their banks, especially in Switzerland where the bank secrecy Law has always been favorable for the deposit of illicit money. (Ledyaeva, Karhunen, Whalley, 2013; Odysseos, 1997; Hansen & Kessler, 2001)

Also in the documentary known as "That Giant Beast that is Global Economy" transmitted by Amazon in its movies dedicated section, Prime Video, and made and directed by Penn Kal, American political and actor, it's talked about countries of South America that have been known as tax heaven for many years at the end of '90s and beginning of '00s, col. Among these, a country that had an important role was Panama.

2.5.2 Panama case study

Panama updated its banking law not long ago but first made money out of its illicit cash benefits. Speaking of the Panamanian economy, according to the analysis made on money laundering coming from KnowYourCountry.com, the economy of Panama which is based on the USA dollars is mainly based on a service sector, therefore a tertiary sector, well developed which it represents over 75% of GDP. These services include the operation of the Panama Canal, logistics, the banking sector, insurance, container ports, the flagship register, and the tourist sector, most of these services are also typical money-laundering channel, as of course the banking sector and major works such as the Panama Canal. Furthermore, the transport and logistics services sectors of Panama, together with infrastructure development projects,

generally those in which dirty money is invested, have favored economic growth; despite this, the Panamanian public debt exceeded \$ 32 billion in 2015, this due to the too much excessive public spending and public works projects (De Sanctis, 2017)

Growth was supported by the Panama Canal expansion project which started in 2007 at \$ 5.3 billion - around 10-15% of current GDP. This project involved doubling the capacity of the canal, allowing it to accommodate ships too large to cross the previous canal. The United States and China are the main users of the Channel. In 2014, Panama completed a metro system in Panama City, valued at \$ 1.2 billion. (De Sanctis, 2017)

The strong economic performance, however, did not translate into widely shared prosperity Panama has one of the worst income distributions, the second worst in Latin America. About a quarter of the population lives in conditions of poverty; however, from 2006 to 2012 poverty was reduced by 10 percentage points. Panama has, however, long been a center for money laundering in Latin America, serving criminal groups that inject dirty money into legitimate institutions, as well as corrupt elites who attempt to hide their wealth through the implementation of numerous offshore companies (Dittmar, 2018).

In 2014, Panama was added to The Financial Action Task Force of Latin America GAFILAT's "gray list", which includes countries whose efforts to combat money laundering are not considered sufficient. In 2015, the Panamanian government pledged to take steps to be removed from the list and lose its reputation as a hotspot for dirty money. To this end, laws have been created to supervise and control banking activities and to better report suspicious monetary assets. The government has also incorporated several recommendations proposed by GAFILAT at the moment (Dittmar, 2018).

Panama was removed from the list in 2016, but scandals such as the "Panama Papers", which revealed a huge number of offshore companies headquartered in Panama, revealed that the country still had a long way to go in the fight against money laundering.

There has however been some progress made by the authorities in recent years, but despite this, the fight against money laundering continues to be a difficult task for Panama. This has to do, in part, with the economic model of Panama, by the way. Indeed, the same factors that contributed to economic growth have been investment incentives such as pending financial regulations that allow for high levels of investment, but, at the same time, also make it easier for criminal groups to hide the source of their illegal revenue (Dittmar, 2018; Esoimeme, 2016).

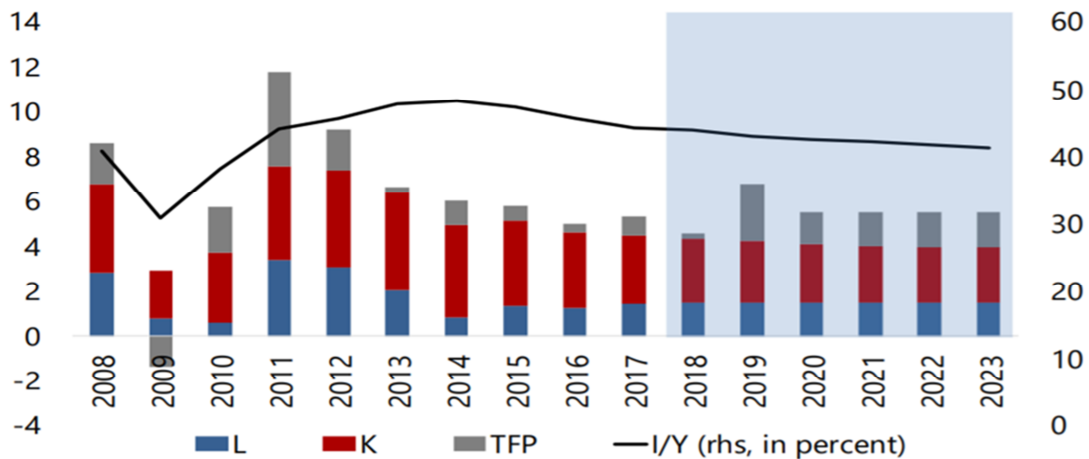


Figure 7 : Panama: Growth Accounting (growth contributions, in percentage points);
(source: IMF, 2018)

In figure 7 is shown the growth contributions for different factors of production. In each period the growth given by labour is always of the one given by capital. Since 2013, anyway, Panama showed progressive acts to adequate to the Anti-Money Laundering rules. By the way, some countries showed clear benefits from the decrease of the shadow economy:

2.5.3 Nigeria case study

How money laundering has impacted the Nigerian economy is different. money launderers are here to import all the necessary mass products like medicines, cars, etc. In this way, it is easier to hide the illicit nature of their finances, but at the same time, since these goods are imported at low cost because they are marketed only to recover illicit funds, the sale price of these imported goods is equally low, with evident damage to local production, which must devalue its products to resist competition from foreign goods (Ikpang, 2011). In addition, another practice used was the typical creation of businesses and companies to mask the recyclers' activities. However, like any other offshore company, these companies are not incentivized to create profits, since the first objective is the washing of dirty money, creating another damage for the country's economy (Arowosaiye, 2015). According to Ibrahim, in the 1980s and 1990s, the period of Nigeria with the highest presence of money laundering, household manufacturing industries had suffered severe price losses and huge investment losses resulting from huge inventories of unsold products due to lack of patronage and consumer preferences for imported goods, thus leading to the collapse of most local industries resulting in a dramatic increase in unemployment and redundancy of the workforce (Arowosaiye, 2015).

Also, as already mentioned, the shadow economy is related to money laundering, obviously also contributing to economic damage. In particular, money laundering and tax evasion are very close. The principle of taxes is to redistribute wealth in favor of social equity. By not receiving the proceeds from taxes, or by receiving less of it, the government is failing to

do so. Money laundering encourages tax evasion as money launderers will try in every way to hide finances to steal them from the taxman; this phenomenon involves not only professional criminals but also legitimate workers (Amahalu, Abiahu, Okika & Obi, 2016).

2.5.4 New Challenges

New technologies have undoubtedly accelerated the times of movements not only of goods but also of capital, services, and financial resources. This context has automatically led to the spread of new financial instruments, new and increasingly "processed" payments (IT), investments, and regulation of commercial and financial transaction techniques. This process is called "financialization of the economy" and, unfortunately, it offers the same advantages to both legal and illegal economic operators. Indeed, the globalization of the economy and the use of the Internet as a fast-medium of transmission have created a network of markets without spatial boundaries, on the one hand, but on the other, they have also made the fight against international money laundering more tortuous. Some are the risks associated with the elimination of internal and external borders between different markets, which must be identified in the ease with which capital can be moved from countries with strong regulation to others with a more latent and flexible regulatory system such as the so-called tax havens or offshore centers.

The possibility of using innovative financial instruments and the availability of sophisticated technologies for the transmission of information and orders allow criminals to act with great speed, to stratify multiple acts of transformation and transfer, to operate remotely in different squares, to hide the identity of the actors and the actual ownership of the assets. The sectors in which criminal organizations invest range from the financial sector, to drug trafficking, to smuggling and counterfeiting, to being reused in investment transactions in large contracts, in hotels and restaurants, in the creation of "ghost" companies, in the large-scale distribution and purchase of properties, including sports clubs (Naselli, 2017). This is going to increase the already high cost of fighting money laundering.

2.6 The cost of fighting money laundering

According to Charles Kenny, an economist fellow at the Center for Global Development “*Global regulations on money laundering are expensive to enforce and unfair to poor countries. They don't work very well, either*” (Kenny, 2015:1)

According to him, at best, the global Anti-Money Laundering (AML) system “snares just a fraction of 1 percent of criminal income flows”. The real money laundering convictions in all regions of the world do not involve more than a few hundred million dollars. In addition, in the USA, less than 0.2% of all recycled materials could be seized with AML's activities.

But AML attempts still cost a lot of money: about \$ 7 billion a year is generally spent only in the United States to implement the implementation of AML regulations according to the criteria of the Financial Action Task Force (FATF).

Moving on to smaller countries, however, the cost becomes disproportionately higher. Mauritius, for example, has 1.3 million people and 25 government officials in charge of implementing the AML - more than the number of opticians - excluding the work done by banking staff to investigate unsafe customers.

Furthermore, due to the rules of the FATF, the possibility for Somali citizens living in the USA to send money home in an attempt to hinder the financing of terrorist activities has ceased. Indeed, this funding was very substantial, even in the order of hundreds of millions of dollars, but, according to economist Kenny, this cut caused unease to the Somali economy as the funding was mostly invested in public expenditure such as education, health, sustainable development, and others (Kenny, 2015).

In Europe, a survey was conducted according to which respondents had a strong perspective on whether AML compliance generated a net positive or negative impact on the productivity of their business line. Most companies (74%) incredibly believe that the impact is negative, particularly in France and Germany, where respondents showed more pessimism (79% and 76% respectively) (LexisNexis, Survey Report, 2017).

The figures down it's showed the impact of AML on the economy, its features, and its outcomes in the different economic areas. In figure 8 is shown the impact of AML on a line of Business productivity, in figure 9 for compliance department, in figure 10 is shown the annual loss of productivity due to job satisfaction and in figure 11 is shown the annual loss in productivity due to AML compliance by Country.

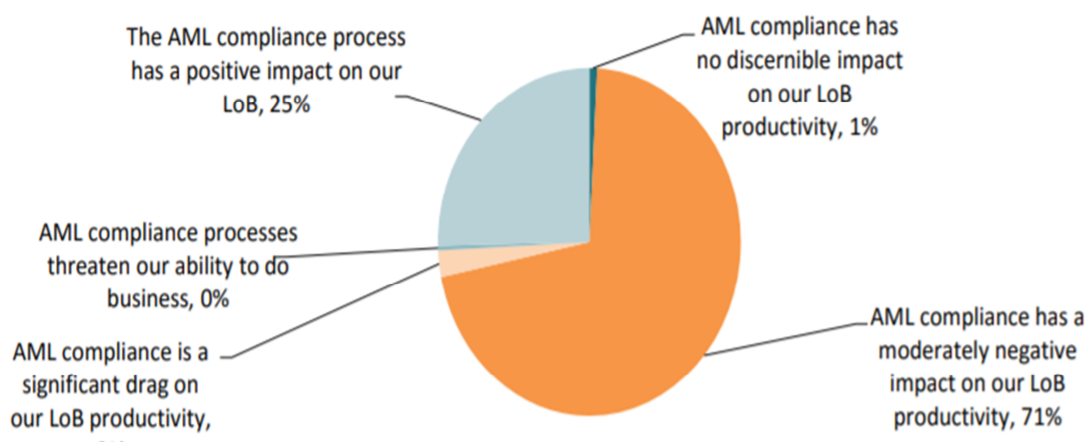


Figure 8 : Impact of AML Compliance on Line of Business Productivity (The True Cost of Anti-Money Laundering Compliance, 2017, Source: LexisNexis.com)

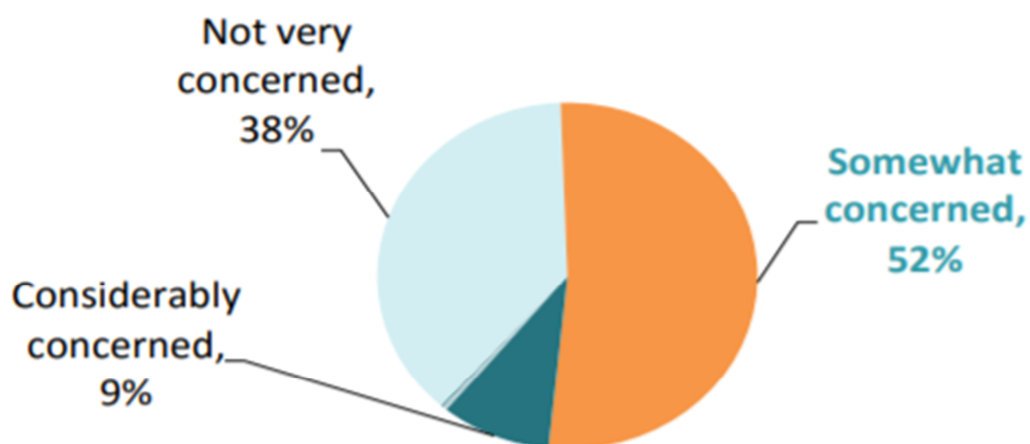


Figure 9 : Job Satisfaction Concerns in Compliance Departments (The True Cost Of Anti-Money Laundering Compliance, 2017 LexisNexis.com)

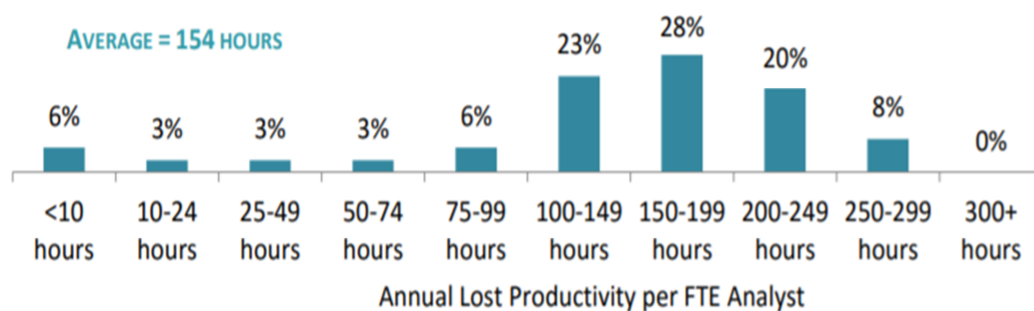


Figure 10 : Annual Loss in AML Compliance Productivity Due to Job Satisfaction Issues (The True Cost Of Anti-Money Laundering Compliance, 2017 LexisNexis.com)

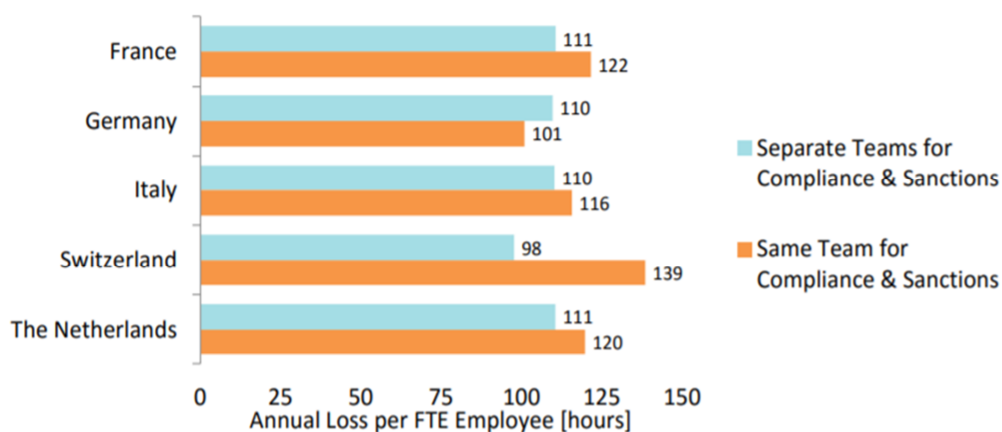


Figure 11 : Annual Loss in productivity due to AML compliance by Country (The True Cost of Anti-Money Laundering Compliance, 2017 LexisNexis.com)

2.7 Fighting money laundering leaving physic cash?

Money laundering is a problem afflicting all societies and economies in the world since those are based on interests. It is spread in almost all economic groups, from the private to the small enterprise to the large ones.

This happens because too much often, in a society where the affirmation in a market where competitiveness is the guideline, washing money represents an over source of money, quite easy and concerning in big amounts. In this way, the enterprise, institution, or whatever, can "show" huge revenues and in this way can decrease prices, gaining a competitive advantage.

But since criminal funds started to be washed, the governments of different countries tried to find items and laws to contrast the phenomenon. This resulted in a cycle characterized by the fight between money launderers and anti-money launderers, so with new techniques to wash cash followed by new techniques to fight the criminal activity. One of the last steps had been the limit on cash transaction imposed by some countries, but in this way money launderers started to take a "digital" direction, starting to use the virtual world with internet and the electronic payments and data to pursue their activity, taking advantage from two of the biggest innovations of the economy and especially related with the money: the electronic payment and the digital currencies.

There are governments, however, that try to encourage a transition to digital methods because, as already mentioned, the latter is seen as a way to discourage and undermine money laundering and tax evasion, even if they are seen as useful. innovations to promote competition in financial services. There are, however, for some, other improvements brought about by digital payments as well as those regarding money laundering; in fact, these are seen as useful tools to protect consumers from theft or loss of money, as well as saving them the hassle and commitment of always carrying a wallet with them (Cerulus & Contiguglia, 2018).

Furthermore, even an analysis made by comparing twenty-seven European Union countries with each other revealed a significant negative correlation between the use of electronic money and the size of the shadow economy (Lombardi 2018)

Schneider and Buehn (2012) have made internationally comparable data available for the size of the grey economy and above all reveal that the lowest grey economy share is from the USA, which has 9.1% of official GDP and while Canada, France, and Germany have the highest share, with around 15%. So, a little evidence was found for a correlation between the estimated amount of the shadow economy and the spread of cash for payments countries (Lombardi, 2018),

But it will appear, further, that, so, the physical cash, even if it's still the favorite item for the launderers, it's not the only one.

As it was said already, different solutions were proposed for each of the new forms of money laundering, but the one that seems to be the most fixable nowadays, concerning the age we are living in, is the shift to a cashless society, dominated by electronic digital payment transactions. Right now, it's almost shared from the most and already supposed by the various previous authors (Ricci, 2016; Fabris, 2019) that a total shift to electronic payment can decrease the money laundering such as various financial and economic crimes, and indeed, this is one of the main reasons about the shift in electronic payments transaction, such as using of credit or debit card, contact or contactless, e-transfer, but also cryptocurrency. This shift could help to fight against Money Laundering and the economic fraud because of the possibility to fully track all the transactions, so having the information about the source, mean, and kind of business.

As talked already, in the past the criminalization of money laundering and so acts against it harmed economic growth showed, showing as some countries performed better with an amount of the economy made by washed money.

In the next part, it will be moved to talk about this measure that represents, right now, the last step of the attempts to contrast money laundering, i.e. the cashless society, about which various authors and various organizations already informed about advantages given by this shift; for example, the traceability of transactions that should make easier to catch launderers. But some problems arise, regarding the growth of the country due to the inability of the population to adapt such a big shift (Ukessay2018; The Economist, 2018)

Besides those, it seems younger citizens and more developed countries were more inclined to use those electronic payments, who the debit card, who credit, who transfer.

According to the survey conducted from the “Survey on payment methods, 2017” (Swiss National Bank, 2017), in Switzerland, anyway, taking as sample 2000 interviewed citizens, it was noticed as the expectation for the future is still using cash, with a kind of “intolerance”, sometimes, for alternative methods, considered often slower than cash payments, costlier and not always available.

Anyway, Switzerland has always been one of the Tax Heaven where money launderers send their illicit money to stay safe.

In 2018, anyway, the Swiss banking secrecy, the rule of not sharing information about banks' clients, started to decline and now the Swiss Government agreed to share all the information about its clients; it could have two meanings, i.e. the decrease of flows of illegal money toward the country and an idea to shift toward a cashless society.

Another survey was conducted worldwide (Capgemini, World Payments Report, 2019), and it was shown as more people were tented to use cash rather than electronic payments, giving also some motivation. Again, the new generations showed as more available to use electronic digital payments, considering the cash as an obsolete payment instrument.

It has already been studied that a big European country such as Italy, representing the 3rd economy of EU but also the highest tax evasion and corruption rate, would have clearly more benefits than costs from a shift to a cashless society regarding the effects on underground economics (Lombardi, 2018.). In the present work, this correlation for countries more or less similar to Italy will be investigated

2.8 The Evolution of Money Laundering toward an electronic era

The official start date of the legal fight against money laundering is 1970 when the Bank Secrecy Act was issued. It was from this law that financial institutions were required to record all major cash transactions and report to the government, therefore, any suspicious taxes. Subsequently, to mitigate the criminal activity, several laws in the following decades followed to make it more difficult to accumulate and hide funds deemed illegal (Metzer, 1991).

But then the era of the Internet and online commerce peeked out, making it possible to achieve a certain level of anonymity only by hiding behind the screen of a computer or tablet, smartphone, or any electronic device.

And from this, a new category of online crime born and started to take advantage of the digital payments industry in order to facilitate washing money. So, regulators, who previously had devoted enormous resources to build complex, and mostly manual, AML processes, now simply can't keep up in this digital age. It is in these circumstances that money laundering, so, became Transaction Laundering.

2.9 Is Transaction Laundering the new way of Money Laundering?

By Transaction Laundering, it's meant the natural, digital evolution of money laundering. This phenomenon is now one of the most difficult challenges that the anti-money laundering regime (AML) has to face nowadays. The laundering of transactions occurs in a very simple case, that is when an undisclosed company uses the payment credentials of an authorized merchant to process payments for another shop, also not disclosed, which sells unknown products and services. (EverCompliant, Transaction Laundering is the New, Advanced Form of Money Laundering, 2018; Houben & Snyers, 2018).

For example, a cybercriminal can create a website in just a few minutes and, by approving payment by card and using a legitimate business account such as an online book store, can mask his income from illegal activities. Online anonymity is what makes this recycling possible. (Silver, 2013; Cyber Security Intelligence, Cyber Criminals Have Ingenious Money Laundering Methods, 2018).

However, by increasing the volume of Internet commerce, the risk of spreading this crime would increase. So how big could this transaction laundering be?

Research conducted by Finextra has highlighted a share of money laundered by laundering transactions, of over \$ 200 billion in the US only, and only for the sale of products and services online. \$ 6 billion of this 200 is proceeds from illicit assets. (Teicher, 2018)

This is a system that uses legitimate online payment systems, carrying out, however, hidden e-commerce transactions through completely legitimate merchant accounts. In this way, many legal websites serve only as a means of payment for all those criminal companies that sell firearms, illicit drugs, child pornography, and other illegal goods online.

A problem that is arising, so, strictly related to Transaction Laundering is the increasing of Money Mule. Money Mule is all those people that money launderers use to recycle their money, through the use of an illicit website, or channel on Telegram, or page on Social Network for selling illicit stuff. Mostly, they aren't aware to make another illicit over the one they are already doing acquiring an illegal product (Europol, Money Mule, 2019)

However, there are not only regulatory offenses; in addition to these, in fact, the laundering of transactions violates the policies on credit card brands, thus placing merchants and buyers in a position of violation of the requirements Know Your Customer (KYC), also violating many other federal regulations, with consequent possible fines and legal actions (Teicher, 2019).

2.9.1 How does Transaction Laundering Works?

Recyclers, in order to process transactions from everywhere, use a store merchant account that. This allows fraudulent merchants to channel unauthorized transactions avoiding the detection of the same payment processors, as well as obviously by the authorities (Yantis, Attia & Lethorius, 2018)

Considering the number of people involved in online payment, the possible combinations with which the deception can take place are many.

It is easy enough for scammers to be able to start hosting companies where the sites and credit card companies with which their payments are made in minutes. (Teicher, 2018)

The scam, as mentioned before, works in this way: A criminal creates an illegal site where shoppers can buy the drugs, firearms, or other illicit goods they want. Most of the times, anyway, the shoppers do not even know they are committing a crime (Yantis *et al.*, 2018)

At the moment they have to pay, they submit their credit card credentials, but not in the drug site, that doesn't take care of the payment, but rather by a legitimate, for example, looking site that pretends to sell a legitimate product, like books

The credit card is so charged, and the seller collects his/her payment via the legit site. Thus, a customer who is going to buy marijuana will have the payment for a book as "Da Vinci

Code" (just to mention one) and in this way, the transaction will show up on the credit card statement issued by their bank (Europol, 2019)

2.9.2 Where transaction laundering is

Increasing the technology in all sector of the legal economy, it wouldn't increase also in the sectors of the illegal economy that developed also other channels to recycle money and the most popular are:

1. E-Commerce

E-commerce can allow to wash illicit money through a legal payment processor. For example, in 2017 there was a suspicion of transferring dirty money from ISIS to the USA through the sale of computers on eBay by a member of the Islamic State. The payment of the transactions arrives from abroad to the creator of the transactions through a PayPal account (Integrity Indonesia, Cyber-laundering, the new face of money laundering in the digital age, 2018).

Some managers have also taken advantage of the services offered by a famous rental app, Airbnb, to launder dirty money by taking advantage of the help of rented homeowners (hosts). The proponents, so, act in this way, book a room from the host and make the payment using a credit card. Subsequently, the host will return the money, obviously under payment⁴.

2. Digital currency

Digital currency (or cryptocurrency) represents a new, unconventional, and more complicated method to launder money, but at the same time, it gives the offenders a higher degree of privacy, managing to better obscure the source of the money (Houben & Snyers, 2018).

How the authors put dirty money into the cryptocurrency system are essentially two. Both ways provide for the exchange of fiat money (irreversible currency) with cryptocurrency in a digital exchange (CoinBase, Bitstamp, Kraken, etc.) through a bank account or using a Bitcoin debit or credit card debit card. The tendency to exchange in digital is preferred to the other since Bitcoin ATMs usually implement money laundering. (Integrity Indonesia, 2018)

The main cryptocurrencies are usually bought (Bitcoin, Ethereum, or Litecoin). Unfortunately, the main currency implements a blockchain system; this is used to store the traces of control of transactions and to obscure them and obtain confidentiality, therefore, a

⁴ <http://community.withairbnb.com/>

series of" stratifications "is performed. Thus, the currency stored in cryptocurrency will be, in a second moment, redeemed in fiat form to your liking of place and time (Pertiwi, 2018: 10).

3. Online games

Pure online games can also be used as a way to launder money. a few years ago, Sony Online Entertainment managed to discover a money-laundering system implemented by one of his users, who, through the purchase of rare and precious objects in games, was able to transfer large amounts of money from an account in the United States to that in Russia (Integrity Indonesia, 2018).

4. Crowdfunding

These sites are accessible to everyone, easy to use, and still do not have anti-fraud and anti-money laundering systems, making it a very attractive place for criminals who need to wash money.

A typical example can be that of creating a fake campaign and donating to the campaign and then collecting them. The bank will therefore probably read and register the payment as legal as it occurred through a legitimate crow funding site (Integrity Indonesia 2018).

2.10 Evolution through E-Commerce

Thanks to the evolution that e-commerce and mobile payments have had, money laundering has been able to reach unprecedented levels too. According to EverCompliant, at the end of 2016, there were 352 billion dollars recycled globally through the use of e-commerce, of which 11 billion dollars related to the sale of illegal goods online.

The laundering of transactions is now increasing dangerously, due to the ease of onboarding of an online merchant and the creation of a florid payment environment for companies. In this way, the installation process of a company with a real business can be skipped, going directly to the creation of an accessible and fast website online.

Furthermore, the anonymity of the transaction laundering allows to carry out the three phases of money laundering (placement, stratification, integration) without leaving any trace. The target of the criminal is therefore achieved faster and with less difficulty, on a large scale, than it would have been achieved with the traditional method, that is, by using cash. (EverCompliant, 2018; Teicher, 2018)

Through the creation of networks of interconnected online entities, it becomes easy to make the transaction and its true source disconnected, therefore, criminals are thus able to

circumvent controls and anti-money laundering measures. The tracing of illegal activities by law enforcement and regulatory bodies thus becomes difficult. (EverCompliant, 2018; The Paypers, Payment Methods Report, 2018; Teicher, 2018)

Furthermore, very importantly, e-commerce has now reached an unlimited and global level. KnowYourCustomer (KYC) requirements are minimal for onboarding merchants. In this way, the conduct of illegal financial activities is made feasible by platforms of this kind. (Teicher, 2018)

Furthermore, even if you do not have a bank account, you can be present in the trade, especially in the online one. "It was estimated that in 2018, Mexico, despite having a 61% non-banked population, was second in e-commerce growth, showing a 59% increase in a year". (Walker, 2018).

Anyway, the shift to electronic methods it's not only made by the consumer because there are also Business Companies that are moving away from cash; "more businesses than ever before are becoming cashless". Airlines and British Airways are two examples of businesses that no longer accept cash for onboard purchases (Walker, 2018).

Moreover, for retailers, decreasing the use of cash would also mean decreasing the chances of facing a robbery; therefore, payments from an electronic device or made online represent a safer system. Besides, to prevent customers from paying cash, some retailers offer online loyalty programs with offers that are acceptable only via email or online on the website.

Either way, it's important to consider that money leaves no trace, so "when it's gone it's gone". But credit and debit card transactions can be easily traced or deleted. Therefore, consumers who use electronic payments or the like, such as debit or credit cards, are protected by the Fair Credit Billing Act, which protects these instruments while for cash there isn't any protection scheme and this could bring to the abandon of cash (Bradley, 2018).

Bank payments and their popularity are based primarily on the trust that consumers have in their bank. By using this method, the consumer has several advantages by being able to make cheaper payments, especially in the Netherlands and the Nordic countries, where bank payments "offer a frictionless payment experience, especially on mobile devices"; faster, and making payments faster, going from hours to minutes or even seconds, there are advantages for both the merchant and the seller; cheaper for the merchant (The Paypers, 2019; Khiaonarong & Humphrey, 2019).

Furthermore, the popularity that online bank payments are gaining, especially among the merchants that operate online in Europe, can be proven by the fact that, according to data that was provided by a Trustly report, most Europeans (i.e. 68% of Spanish citizens, 66% of Italians, 61% of French citizens, 55% of Germans, 55% of Dutch citizens and finally 51% of Swedes) would have no problem making purchases from foreign websites, if there were no need

to enter credit or debit card information and thus disclose it to foreign and unknown merchants. People would, therefore feel more likely to make purchases on sites belonging to a foreign jurisdiction if only online banking were also accepted to pay (in Spain the 59% such as in Italy, in Netherland the 55% of inhabitants, 47% of French people, 44% of Germans citizens and the 35% of Swedes), always according to the report mentioned above, as it guarantees a risk of fraud almost absent compared to that deriving from credit card payments. (The Paypers, 2019).

The information collected in this chapter, together with the information related to data of the next chapter, is determinant for the choice of the variables/indicators for the analysis of the next chapter.

3 Through the new era of electronic transactions: The evolution of money

3.1 Grounding the method

The first part of this chapter is based on the explanation of the choice of data. So, an overview of the evolution of the money, the use of cash now, and the electronic payment systems more used is necessary to understand the selection criteria.

3.1.1 Through the new era of electronic transactions: The evolution of money is the evolution of society

“The evolution of modern money will also help us to understand some important nuances about the role of government and technology that will prove useful in analyzing the scope for alternative currency systems in the future” (Rogoff, 2016, p. 15).

Since the money in its physical way was invented, i.e. in Lydia, it has always acquitted the function of certainty of value and medium for transactions. For Westerns, anyway, history starts thanks to Marco Polo’s discoveries about paper money in China.

And paper money has always had a crucial role in the developments of history, for example, II WW could have not started without the hyperinflation caused by the huge amount of circulating cash. But also, history if paper money is very interlinked with the development of technology and society. But what is important of the money is that it is, totally, not static. The first commodities used as currency were slowly replaced by metal coinage, coins were partially replaced by paper notes and they could be replaced by electronic currencies, as parts are already been (Rogoff, 2016).

And indeed, right now, according to UKessay (2018:1), *“we are currently seeing the gradual abolition of cash”*. In the last decade, the physical money is, however, slowing down its growth in a clear way, indeed the trend now seems to be a now unstoppable decline. In the last 10 years alone, the amount of cash in circulation has decreased by about 30% and the value of payments by cash has also shown decreases in the order of 10% per year (Jenkins, 2018).

Anyway, some authors illustrated how between 2012 and 2015, there was an increase in non-cash alternatives used for payments. In those three years, non-cash payment methods have increased year on year by just over 5% and just over 3% in value (Mercadante, 2018). What led to their diffusion is mainly given by the efficiency, the ease with which they make payments possible, and the fact that these are much more flexible (Bolt *et al.*, 2008).

Furthermore, in 2016, almost 50% of total payments involved the use of liquid money. (Davis, 2016; Khiaonarong & Humphrey, 2019). Despite the amount of money in circulation,

therefore, it is always quite high considering the hypothesized drop in cash, compared to 2007 this figure shows a decrease of 22% when 69% of all transactions were conducted by cash (Davis, 2016). Comparing, therefore, the various statistics, both current and those of past years, highlight the constant decline of cash and the continuous change of the economic attitudes. In some countries, moreover, it's witnessed an even faster decline than others as regards the use of cash; in the United Kingdom, for example, although the demand for physical liquidity from the financial crisis continues to increase, in the period of one year between 2015 and 2016, the number of all cash payments has declined sharply, greater than 10%, and consequently, the value of these payments also fell by 5%, reaching the value of £ 240 billion (The Paypers, 2019).

The world is so slowly moving toward electronics infrastructure through transactions that can be made. It's their feature of frictionless and their speed that make e-payments advantageous on cash, and this is why they're spreading a lot in some countries such as in China, where in the past 5 years Alipay has issued \$96 billion in loans, but 1 billion \$ of business was also caught by Amazon between 2017 and 2018 (Bradley, 2018). Moreover, the reachability is one of the best advantageous, because smartphones become the wallet of choice that currently accounts for around 60% of all payments. Digital wallets are more convenient.

Large success seems to be gained by digital wallet because their usage is increasing all over the world. A typical example is the spread of PayPal and Apple Pay, increasingly popular apps that now dominate the online shopping websites, with the possibility to complete transactions with a "click" (Bradley, 2018).

According to the Payment Methods Report by The Paypers (2019), anyway, the total decline of cards for payments (credit cards such as debit, prepaid, and all the other types) is still far, indeed their usage is expected to increase over the next four years. According to Global Payments Report by Worldpay, payment cards are still the most spread and used payment method for the eCommerce in 2018, with a 37% share of all the purchases (The Paypers, 2019). Additionally, while there were more than 6 billion cards in 2018, payment cards operating on a global basis were expected to reach nearly 12 billion by 2023 (with around 8 billion debit cards). If, of course, much more moderate growth is expected in already mature markets, where the use of the payment card has already almost become a normal means of payment, as regards emerging markets, payment cards should grow much more decisively with also the support of digital wallets. In 2018, the value of the global card issuance market is estimated at 45 trillion dollars (Ukessay, 2018). In figure 12, indeed, it's showed the change in the spread of payment methods from 2018 to what is forecasted in 2022.

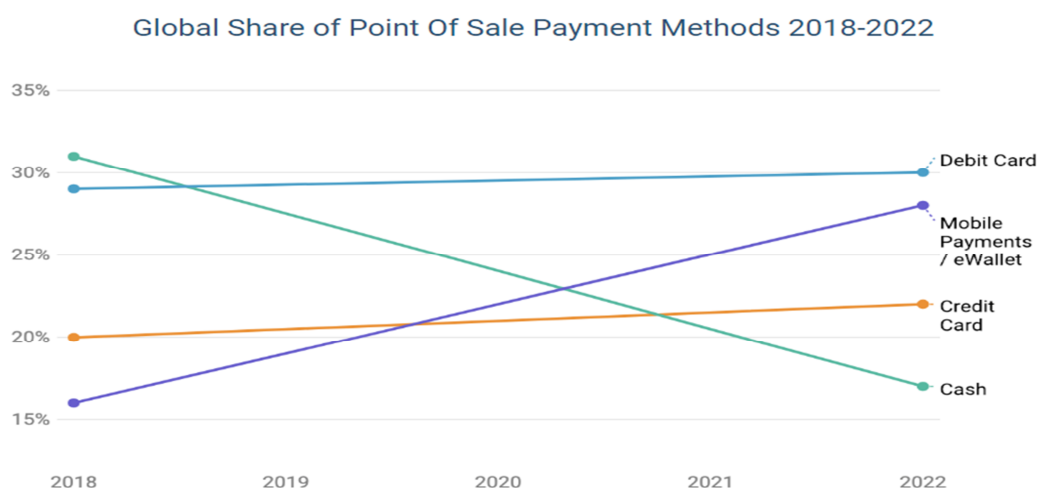


Figure 12 : Global share of point of sale payment methods 2018-2022, (source: MerchantSavvy, 2020: 1)

“Bank transfers, debit cards, credit cards, e-wallets, and mobile wallets, are now the top payment methods used to process the 122 billion digital transactions made each year. Customers are paying less and less with cash, and it is slowly but coming to an object of the past. In fact, PPRO research has found that more than a quarter (26%) of consumers now find it irritating when they are forced to pay by cash rather than by card.” (Black, 2019: 1)

3.2 Overview on countries payment methods

Credit and debit cards are still preferred, globally, in western markets, i.e. those of developed countries, such as the USA and Europe, especially as regards E-commerce. As already mentioned above, the spread of payment cards in developing economies is supported by the use of digital wallets. For example, some systems make it easier for a consumer to connect their card to their e-wallet account, such as Unified Payments Interface (UPI) in India, a payment interface used for this purpose.

Payment cards dominate the European and US markets, holding in both almost half (Europe) or more than half (USA) of the total share (Global Payments: Transformation and Convergence, 2020).

All world banks hope to stop the production and spread of the currency. In Ireland, this process has already started with the blocking of 1 and 2 cent coins as a means of payment. South Korea also appears to be following the same path as Sweden, attempting to eliminate all currencies in the coming years (Jenkins, 2018).

3.2.1 USA

In the USA, the shares of payment methods for the e-commerce sector are divided as follows: credit cards are used by 34% of the payers, while the others are detached enough since the electronic wallet has a 20% share, debit cards by 19%, debit cards deferred by 13%, then

ending up with the others who are used by less than 10% of the payers, such as bank transfer (6%), cash on delivery (4%), the prepaid card (3%), and finally other less widespread methods such as PrePay, used only in 1% of payments as well as all the other unimportant ones. The payment methods that use the POS, on the other hand, are much more unbalanced towards the payment through cards, with the credit card exceeding 40% and the debit ones reaching almost 35%. Cash represents only 16% of payments, while other methods such as debit card, e-wallet, and prepaid card do not reach 5% each (Worldpay, Global Payment Report, 2018)

For the next years for this market, until 2023, Worldpay assesses the drop in the use of cash at the POS for around 5% (Worldpay, 2018) mainly by migrating to electronic wallets. The company plans to double its use of the electronic wallet by 2022. In the USA, awareness of digital payment methods, for example, electronic wallets, is growing steadily, including the most popular ones that can be used in stores in December, i.e. 2017 were Apple Pay and PayPal. So, almost 300 million people had an account PayPal worldwide in the first quarter of 2019 and, in December 2018, more than 35% of retailers in all USA had already started to accept payment through PayPal; a further 34% were added in 24 months (Constantinescu, 2019). Figure 13 illustrates the development forecasted until 2022 for payment methods in the USA, such as figure 12 did generally.

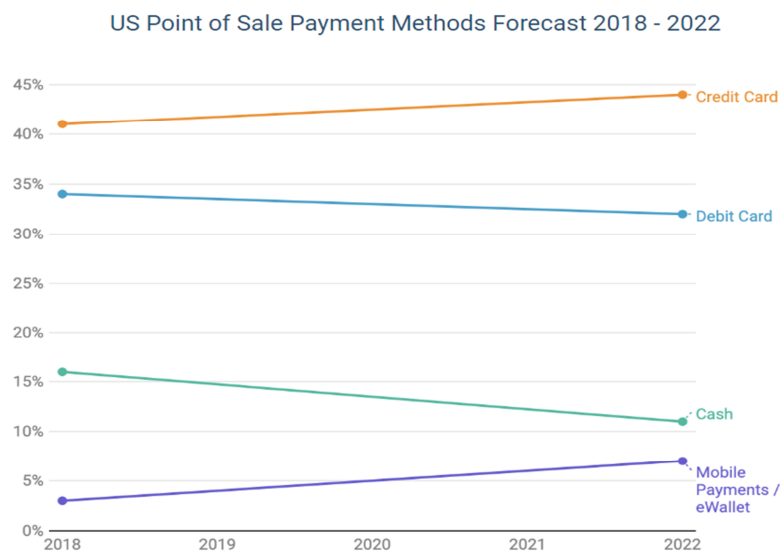


Figure 13 : US Point of safe payment methods as % of total Forecast 2018-2022 (Source: MerchantSavvy, 2020:1)

3.2.2 Europe

Online banking payments across Europe are one of the main growing payment methods, getting the maximum boost due to the combined effect of Payment Service Direct 2 (PSD2) and Single Euro Payments Area (SEPA) Instant Credit Transfers. In some markets,

the innovation for digital authentication methods has begun to take on increasing importance in favoring the popularity of online banks, such as the simultaneous transition to customer-to-business and business-to-customer payments, like Tikkie in the Netherlands and Mobile Pay in the Nordic countries (The Paypers, 2019).

According to Worldpay's Global Payments Report 2018, in Europe, there are different online banking ePayments systems, and in the next years, the use of credit and debit cards will be overtaken, globally, by the spread of this different payment method. Furthermore, according to Ovum, instant payments, with a value of about 340 billion euros for Europe, will become one of the principal online payment instruments. (Worldpay, 2018)

In November 2019, the European Central Bank (ECB) published data showing that the percentage of payments made through the use of card machines is continuing to accelerate across Europe, showing also regular use of mobile banking by 84% of Europeans. Another study dated 2019, from Mastercard's Digital Banking, reveals how important this method has become for most Europeans, confirming the ECB study specifying that mobile banking from traditional banks is worth 63% of the total while another 21% of the total value comes from digital-only banks (Visa, 2017; Schachinger & Linsser, 2017; Eurosystem database)

Anyway, 27.7 Billion is the amount of digital transactions in 2018 in the United Kingdom (UK), the highest in Europe, making the British country the biggest cashless spender in that year, followed by France (23.5bn) and Germany (22.7bn) (Merchant Savy, Amazing Stats Demonstrating The Unstoppable Rise of Mobile Payments Globally, 2020).

3.2.3 Sweden

"Sweden heads the vanguard", keeping the words pronounced by Financial Times reporter Patrick Jenkins (2018). Sweden is already progressing towards a cashless society and it's the country that is doing it most. In Sweden, in recent years there have been important developments in the adoption of mobile and electronic payment systems, with more than 90% of the population that can access to online banking apps, such as Swish for example, and on average each person carries out more than 270 card transactions each year (Segendorf & Wretman, 2015). As a result, the demand for liquidity in Sweden has decreased, such as the demand for liquidity as a present value reserve, and the demand for liquidity for transactional purposes. In 2015, liquidity represented only 1.5% of Swedish GDP (Sivabalan, 2017), down from 4% in the early 2000s (Ukessay, 2018).

In 2015 Sweden made a lot of investment in IT so that it ranked third out of 148 countries in the use of ICT systems (Segendorf & Wretman, 2015). This, added to the adoption of specific and certified cash registers, Sweden has given a significant boost to the reduction of VAT evasion. As a result of this action, there has been the closure of bank branches and ATMs

and the possibility for the Government to introduce negative interest rates. According to Jenkins, a cashless society is imaginable in the northern country and in his opinion Riksbank will finish printing notes since 2030 (Jenkins, 2018)

3.2.4 United Kingdom

Payments made via mobile phone and contactless payments in the UK are very popular, as it appears that the state is preparing to become a cashless company. Physical money is rapidly becoming an excess in today's society, increasingly connected to the online world with a third (33%) of the United Kingdom claiming to no longer use cash. In fact, ATMs have been less used, with 44% of people using it less and less (Clarke, 2018)

In 2016, the volume of contactless payments in the UK was £ 26 billion (Clarke, 2018); Compared to the present value, cash transactions could decrease by 26% by 2025 (Clarke, 2018).

The United Kingdom is rapidly moving into the new era of cashless payments. The forecast is that the next five years will be crucial for the proper development of cashless payments by effectively taking control of them. (Walker, 2019)

The payment card infrastructure is not yet well developed in some growing economies of APAC, LATAM, and Africa, where also a high share of the population is unbanked. As a result, some African countries have developed alternative payment systems.

Kenya and South Africa figure prominently as examples of markets where the journey from cash to “cashless” is progressing. Kenya launched already M-Pesa, a platform that manages online payments in the country for almost all services, and it's possible to be used with a smartphone. In South Africa, the central bank of the country (South African Reserve Bank - SARB) approached to the payment ecosystem stems showing an understanding of the critical role and impact of regulatory regimes on the payments space from a global vision (Worldpay, 2020)

3.2.5 Asia and Pacific

In 2017, the global volume of digital commerce registered an increase; This increase is also expected to go on in all areas of the world. The Asia-Pacific area weighs more than half of global digital commerce, thanks mainly to the fast growth of the Chinese market and is heading towards a digital era just as quickly (Bech *et al.*, 2018).

The Chinese market has been penetrated by digital wallets (for example Alipay) and these will remain in strong growth until 2022. In 2017 the additional contribution of digital wallets added about 40 billion to global payments revenues (Bech *et al.*, 2018).

Moreover, in China was conducted a study according to that it was estimated that more than 50% of the Chinese population use cashless payments; a typical example is Alibaba

(Alipay); electronic payments were from this share of population for more than 80% of transactions, that totally represent 60% of China's total payments (Jenkins, 2018). China will probably be the next country to follow a path similar to the Swedish one towards a cashless society, also thanks to the rapid technological growth of the region. In China, consumers can purchase products and services only using phone numbers, QR codes, and the latest development, facial recognition (Bech *et al.*, 2018).

China and India are driving the expansion of e-commerce, but, due to the weak penetration of debit and credit cards, it is difficult for merchants to enter these markets. Debit cards in India are still the favorite and most used method for online shoppers to pay, from a report by Financial Software and Systems (FSS), which is one of the biggest and most important Indian payment processors.

India recently attempted to limit the use of cash, demising the highest value note, i.e. 500 and 1000 Rupiah, but the results were negative for the economy and useless to emerge underground economy (Timpone, 2018)

In Singapore, credit and debit cards take still the biggest share of the online payments with more of the 50% of these transactions that involve cards; in the country of Philippines, is the cash, still, the most popular mean of exchange. (Merchant Savvy, Amazing Stats Demonstrating The Unstoppable Rise of Mobile Payments Globally 2020;). Figure 14 illustrates the development forecasted until 2022 for payment methods in Asia, such as figure 12 did generally.

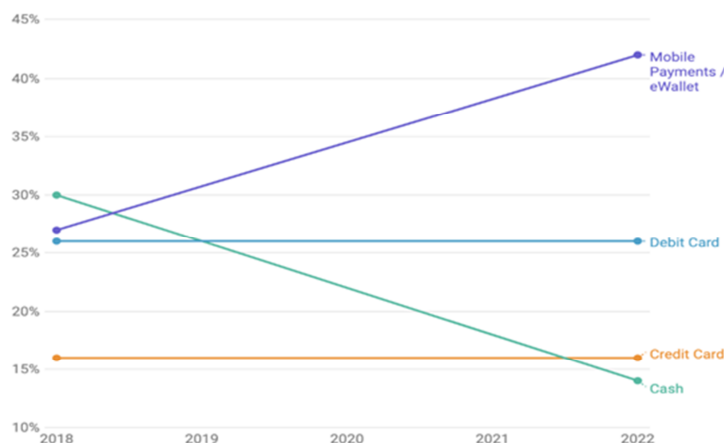


Figure 14 : Asia Pacific Point of Sale Payment Methods forecast, 2018-2022, (Source: MerchantSavvy, 2020:1)

With an overview of payment methods in different parts of the world, it's possible to talk about relations between the payment methods of countries with their risk (or effectiveness) of money laundering.

3.3 Size of the Shadow Economy and impacts on cash on circulation

After the overview of the evolution and diffusion of money and electronic money, what is important is to define the size of the shadow economy, which has been found, in previous chapters, to impact the use of cash from ordinary daily payments and overtime. Furthermore, a comparison between twenty-seven countries of the European Union has already been mentioned and that reveals a significant inverse relation between the size of the shadow economy and the usage of electronic payments and the information provided by Schneider and Buehn (2012) and reveal that the United States has the lowest grey economy share of the grey economy with more than 9% of official GDP and Canada, Germany and France have the biggest share, with around 15%. In other words, a little evidence for a correlation between the size of the shadow economy and the use of cash for payments was found (Lombardi, 2018).

Moreover, according to Di Cocco Frederick, Head of Sales and Relationship Management in Bank of New York Mellon, paradoxically, in some markets there are regulators that create conditions for driving transactions out of the banking sector; this is a curious fact as this is the sector in which, at present, the activity is better regulated and controlled. Current approaches risk therefore to reduce the amount of not licit transactions in banks, but at the same time there is a risk of over-regulation, which could lead to transactions out of "control" and reduce the total effectiveness of regulation and application (Capgemini, 2020)

So, among the different benefits that a cashless society could lead to, i.e reduction of the cost of cash, emersion of the underground economy, an increase of the consuming cycle, the security of transactions, stimulation of consumption, the aim of this chapter is now to focus on the emersion of the underground economy, the consequences and the ways to challenge it, to better understand the analysis left for the next chapter.

As said already, the shadow economy in Italy accounts for 21% of the GDP, the only one of the "Big-5" in Europe higher than 19%.

It has been stated already, taking Italy to the European average for e-payments could mean recover almost 70 billion and thus reduce the missing VAT (IVA) revenues. As already said, a higher spread of cash is usually highly correlated with a higher degree of the underground economy. According to different research works, an increase in the number of electronic transaction by 10% for at least 4 consecutive years will reduce the underground economy by 5% (Lombardi, 2018).

According to Per Bolund, Swedish deputy finance minister, the transition from cash was excellent for tax revenues (Jenkins, 2018). Furthermore, according to Jenkins, a question for many economists is why the increase in circulating cash compared to GDP is evidently due to crime and tax evasion.

According to Sands, however, drug trafficking is one of the main, if not the main, engine of illegal financial flows (Jenkins, 2018; Ukessay, 2018). Getting rid of money seems to make it easier for governments to fight tax evasion, a global problem especially in the USA and Europe where the total amount of money laundered, exceeds \$1 trillion dollars each year (Summers, 2016). In 2011 alone, 19% of the total income that had to be reported in the United States, instead was not (Zorpette, 2012). Moreover, in Ireland, it is estimated that there are 200 euros of the unpaid tax for every 100 paid (Ukessay, 2018)

Tax evasion, like money laundering, however, is strictly linked to human trafficking and drug trade; the employment of illegal immigrants is a typical problem arising from the availability of liquidity. Around the world, illegal workers estimated are 230 million (Rogoff, 2016), occupied mostly in the construction sector and the agriculture one (the so-called "cash jobs"). These incomes are difficult to estimate because of the liquidity. The number of illegal immigrants working, for example, in the USA would decrease strongly if cash would be eliminated, such as would the drug trade, the human trafficking and other several activities of the black economy; in general, the overall amount of money to be washed would decline; this will be the topic tested in the analysis of chapter 3 and 4.

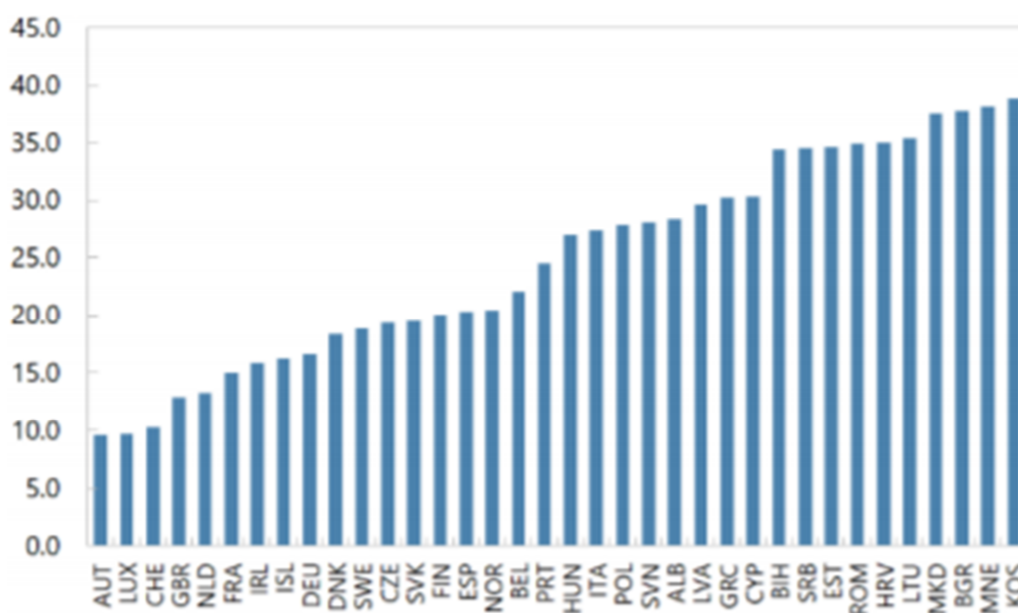


Figure 15 : Size of Shadow Economy in European Countries, 2016, (Source: IMF)

In figure 15 is represented the size of Shadow Economy in 2016 in European countries, while in figures 16 and 17 are represented the sectors (and so, the determinants) of the shadow economy, where it spreads and where it is paid more.

The shadow economy of the five focus countries, divided by sector

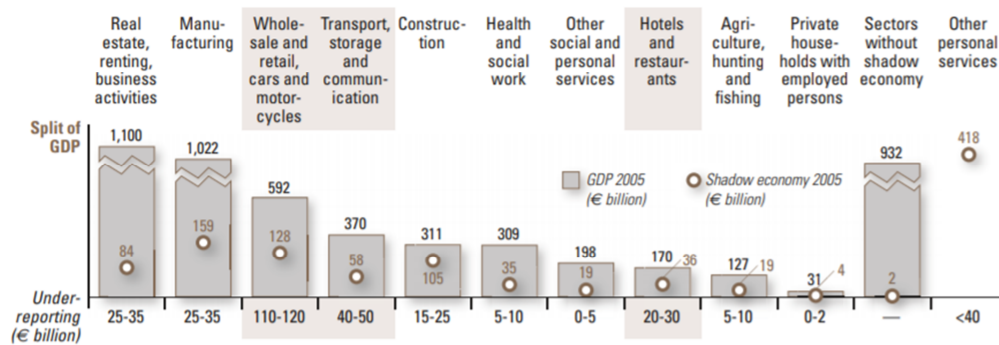


Figure 16 : The Shadow Economy of the five focus countries, divided by sector, (Source: Schneider, 2016)

Sectors where electronic payments can pay off

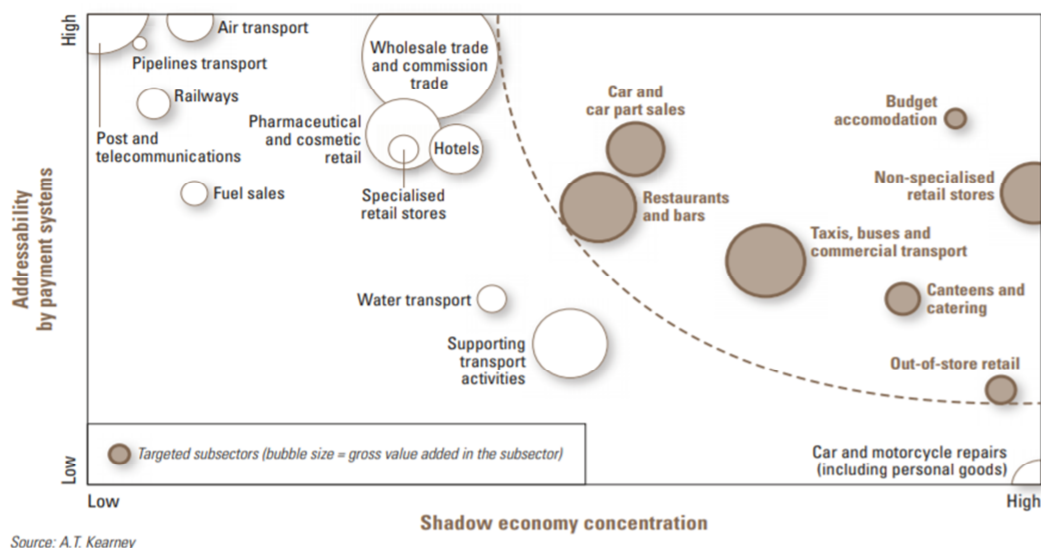


Figure 17 : Sector where electronic payments can pay off, (Source: Schneider, 2016)

As it's possible to see, in general countries directed toward a cashless society are characterized by a low underground economy, corruption, besides some exceptions.

So it can be suggested a kind of negative relationship between money laundering/shadow economy and amount of cash, as a high rate of the underground economy slow down the movement toward a cashless society. This can be suggested also by the normal and natural preference of criminals and money laundering for physical cash, not traceable and so anonymous.

3.4 The current use of “cash”

Liquidity as a means of payment is used to carry out transactions involving goods and services. In this way, cash is tied to the experience of the consumer. Hence, physical liquidity remains crucial in cost management (Dubey & Berghout, 2016). However, there is no unanimously preferred payment method, as everyone has their preferences, thus causing an increase in payment methods; for example, bank transfers via the Internet or payments focused on consumer tastes through Fintech companies may be mentioned. However, according to some economists, the increase in such digital transactions does not come as a consequence of the abandonment of physical currency, however, many individual traders prefer to use cash (Dubey & Berghout, 2016; Khiaonarong & Humphrey, 2019).

According to some authors, therefore, in addition to the payment cards already mentioned regarding the emergence of electronic wallets, even the money does not seem destined to run out soon (Fish & Whymark, 2015). Despite the talks of a cashless society and the deterioration in the use of liquidity for transactions, the demand for physical liquidity is increasing, especially with the decrease in the opportunity cost (Bech *et al.*, 2018) and also the total value of the banknotes and coins in circulation. This demand for liquidity has grown since the latest global financial crisis. Despite the talk about a company that does not use cash for transactions, the actual demand for liquidity is continuously increasing in most countries (Bech *et al.*, 2018), and with it, the total effective value also of liquidity in circulation; this increase began especially since the end of the last economic crisis.

It has been estimated that the value of the banknotes and coins circulating in the English economy in 2018 was around £80 billion (Clarke, 2018), and almost the same situation in Australia, with \$73 billion in circulation (Davis *et al.*, 2016). According to Jenkins, there are trillions of paper cash and coins in the economy nowadays (Jenkins, 2018), so it seems easy to guess that the probability that cash will die in the near future is unlikely. In fact, cash is still important for consumers, with physical money currently representing almost 10% of total global GDP (Jenkins, 2018). Indeed "money is printed freedom" (Campbell, 2018) and therefore should remain in the economy for the future (Jenkins, 2018), but still, according to the Global Payment Report 2020, things don't seem to be exactly like that.

3.4.1 The technologic evolution of cash

In June 2018, the amount of debit cards reached almost one billion in India alone, of which about 20 million issued for new holders (Bansal, Bruno, Denecker, Goparaju, Niederkorn, 2018)

From October 2018 to January 2019, there was a withdrawal of 67 million debit cards ordered by the (Reserve Bank of India) RBI to replace them, as old and with the magnetic

stripe, with the new cards Europay, Mastercard and Visa (EMV), safer because it is based on a chip. However, there have been other government initiatives to encourage the use of Visa and Mastercard cards, for example, Smart Cities Mission, i.e. a smart city project. And so, in the last month of 2018, more than 20 million contactless cards were issued by Visa. In addition, in May 2019, thanks to a partnership between Paytm Payments Bank and Visa, the latter has launched its debit cards that now, in India, are able to compete with UPI (Unified Payments Interface) payments in terms of use.

This *“UPI is an instant real-time payment system developed by National Payments Corporation of India aimed to facilitate inter-bank transactions”* (The Paypers, 2019: 1).

The USA tap and go payments took so much to spread to the North American country, where large-scale implementation occurred in 2019, allowing card-issuing banks to acquire market share. In 2017, payments from US consumers reached more than 6 trillion \$ in all cards, which is 8% more than in 2016. Given the complex composition of the market (a multitude of banks and merchants and a very fragmented payment sector, data breach), issuers have started to issue chip cards, which are more difficult to counterfeit (Păstrăvanu, 2020). When there are terminals that accept chip cards, the cards need only be updated to complete the change in contactless. However, this delay in chip cards leaves the United States behind in contactless cards. Fortunately, in November 2018, card issuer JP Morgan Chase announced that all of its cardholder customers will be transferred contactless by the end of 2019. Additionally, according to Visa, 100 million contactless cards have been started to be issued in the United States since the end of 2019. Another new feature is the Rewards credit cards. These multiplied so that their use was facilitated especially in developed economies, offering hundreds of dollars in prizes, cashback, points (Păstrăvanu, 2020; Visa, annual report 2019, 2019).

Transactions should always be fast, so there are always innovations and improvements in technology, especially in the mobile payment space. Evolving, digital payments led to the birth of e-wallets. In World Payments Report 2018 by the Capgemini, approximately 41.8 billion non-cash transactions made via e-wallet globally, of which a value of around 71% (or 29.7 billion) was conducted through the payment app and electronic wallets, services offered by Big Tech for those who are customers. This payment method has proliferated due to smartphone penetration, increased mobile payments, consumer behavioral changes, and regulation. Furthermore, the combination chosen between frictionless payments (based on customer experience), security, and the added value obtained using the service and innovation around these portfolios seems to be successful. Therefore, several reasons make these tools destined for popularity, as they are easy to integrate on multiple devices, they can often be used on all channels, they are user-friendly, they encourage loyalty and marketing programs - and all sorts of new ideas regarding payments (eg Apple Card connected to Apple Pay). The three most

important global e-wallets are PayPal, WeChat Pay and Apple Pay (Capgemini, World Payment Report, 2018)

Besides cards, also in Europe another method that is spreading its usage is MobilePay, started by different banks in different countries: Danske Bank in Denmark, DNB's Vipps in Norway, and Swedish bank in Sweden. Among a population of almost 30 million in all Nordic countries, Swish has acquired 13 million users. So, MobilePay has been estimated with more than 4 million users in Denmark (almost 70% of the population), 800,000 Finnish users (15% of the population), and almost 7 million in Sweden (around 67% of the population), while around 3 million are users of the app Vipps in Norway (57% of the population). The success gained by the Nordic electronic wallets has sparked international interest. While Sweden-based Swish appears to focus primarily on its domestic market, Denmark-based MobilePay and Norway-based Vipp aim to an international spread (The Paypers, 2019). In addition to MobilePay, in Nordic countries there are also, of course, global brands such as Apple Pay, Google Pay, and Samsung Pay, but also there are local initiatives, like Paylib and Lyf Pay (France), Pingit (the United Kingdom), Payconiq (Germany, Belgium, the Netherlands), Vipps (Norway), Swish (Sweden), Payback (Germany), and OK (Netherlands). In addition, by partnering with retail chain stores, local electronic wallets can offer added value to customers (eg OK in collaboration with Dutch retailers; Lyf Pay has partnered with Carrefour) (Capgemini, 2018).

Latin American (LATAM) countries, on the other hand, has three main types of e-wallets: contactless mobile wallets such as Apple Pay, e-commerce wallets such as Visa Checkout or Amazon Cash and wallets with stored value; these allow users to "top up" their mobile money accounts for mobile phones. PayPal has been very successful in these countries thanks to its security and its additional services (eg. Free return shipping) which allow the use of the wallet for a wider environment in electronic commerce, in LATAM.

In North America, as already mentioned, the pace of progress towards contemporary technologies such as electronic wallets are mitigated by mature technological infrastructures, a consolidated and therefore extremely scalable economic and technological sector, and with widespread habits and preferences, established and installed during the course of generations. The typical user of mobile payment methods is more than 30 years old with training already acquired in a different technological period. Indeed, according to the Statista report on the use of mobile payments in the United States, in 2018 only 15.4% of mobile payments customers used electronic wallets designated as PayPal or Google Pay (Bansal *et al.*, 2018)

Another method that is slowly taking the scene is Instant Payment. Instant payments help online bank payments grow to become a payment method widespread throughout Europe. With cross-border transactions, this method can also be more beneficial for merchants. Even in the United States, as an alternative to credit cards, this method is catching on. PayWithMyBank

is one of the best known ACH payment providers in the USA. The ability to pay, through this method, or to be paid is easily done by logging into your online bank account without leaving the merchant's site or app. In June 2019, PayWithMyBank merged with Trustly and together they manage to have a transatlantic coverage of online bank payments. Both companies give possibilities to merchants around the world to accept payments implemented through online banks from the USA and European consumers.

This merger meets the needs of merchants that are searching for a different method to cards by accepting online payments also directly from consumers' bank accounts. Another instantaneous system was developed in India and is the already mentioned Unified Payments Interface (UPI), i.e. *a real-time payment system developed by the National Payments Corporation of India* (def. by Wikipedia). The role of the Reserve Bank of India is to directly regulate the interface; when it is needed, it can instantly make a transfer between two bank accounts only on a mobile platform. Additionally, in January 2019, the volume of transactions through the UCI exceeded that of credit and debit card transactions, according to the National Payments Corporation of India (NPCI) and Reserve Bank of India (RBI), even if not so much (The Paypers 2019; Capgemini, 2020; Hasan, Antifaman & Ali, 2020)

The digitalization of the economy is starting, so, to have its consequence; in the past few years, many banks around the globe have been closed; in Ireland alone, each month 60 branches were closing since 2015. Anyway, according to economist Andy Haldane, the decline of cash will bring to the bank's new flexibility in the case of another downturn (Giles, 2015).

Anyway, the digitalization of the economy has brought developments in both, legal and illegal economy. Criminals, indeed, also managed to adapt to the opportunities given by the new technologies. The new development of money laundering, in particular, takes the name of "Transaction Laundering".

4. Data and Methodology

4.1 A mixed approach model as a starting point

Given the nature of the topic, statistical analysis can be difficult. Indeed, as already said, a lack of data is always a potential problem of analysis like that. In order to fill this gap, several methods have been employed to measure the size of the shadow economy:

- 1) There are direct work-based approaches with surveys, tax control, and other compliance methods. These methods give the possibility to get information on the structure of the shadow economy. However, the information collected may not be representative and can be inconsistent for different states.
- 2) Then, there are indirect approaches that include the analysis not using single indicators but relations among them, for example, there can be the difference between public expenditure and the income, or the discrepancy between GDP growth and electricity consumption growth, or even between the actual amount of currency circulating in the economy and the amount of that requested from the population. However, these measures logically also involve other underlying assumptions (elasticity, the velocity of money, the base year of the estimation, etc).
- 3) A third model is based on the foundations of the Multiple Indicator, Multiple Causes (MIMIC) model, launched by Frey and Week-Hannemann (1984) and then expanded by Schneider (Explaining the Shadow Economy in Europe: Size, Causes, and Policy Options, IMF working paper, 2019). This is the method I am going to use, as already said even if it will be adapted for the topic.

So, the method implemented in this thesis is based on a direct approach with the collected data from a lot of the most important databases of the web, but the choice of data to collect is based on the hypothesis of the Multiple Causes Model. Indeed, “*Multiple Indicators, Multiple Causes Models (MIMIC) are often employed by researchers studying the effects of an unobservable latent variable on a set of outcomes, when causes of the latent variable are observed*” (Tekwe, Carter, Cullings & Carrol, 2014: 1).

Schneider as well illustrated the use of this model for measuring shadow economy “*Statistical models that use statistical tools to estimate the shadow economy as an “unobserved” or “latent” variable; e.g. the MIMIC (Multiple Indicator, Multiple Causes) Method*” (Schneider, 2019:9).

So, the direct approach will be based on the hypothesis that when one variable is unobservable, multiple effects of its observable determinants are done. This direct approach

consists of the analysis of each of the determinants of the unobservable indicator (Money Laundering) chosen, with the use of those variables whose I wanted to study the effect on ML, which are variables related to the spread of electronic money and limits on cash.

After, the analysis will be, so, implemented different times, each time choosing a different dependent variable among the indicators chosen as the determinant of money laundering or shadow economy. The method is based, as above, on the hypothesis of the MIMIC model, according to which, an unobservable variable can be estimated with those indicators seen as a determinant of that. In my work, using the Fixed Effect method for Panel data, a relation between the indicator considered as a determinant, and indicators regarding the incentives for e-money will be analyzed. Besides the theoretical ground that gives validity to the choice of variables, the determinants will be checked twice with the indicator for "ML", one directly, in estimation with ML as variable Y and the determinants as X variables, and one indirect, through an Ordinary Least Squares (OLS) analysis, checking if the effect of E-money on ML is coherent with the effect found for E-money to the determinants of ML. These estimations, singularly, don't have too much significance because of the few amounts of data directly referred to money laundering, but together, as "check" of the other regression they can get validity.

What are, so, the main causes that can determine the size of the shadow economy and of tax evasion? Different authors found different determinants; according to Schneider (2019), for example, some of the determinant factors, with the expected signs, are:

- Federal system (-)
- Consistence of regulations (+);
- Income (-);
- Public Sector Services (-);
- Quality of public institutions (-);
- Self-employment (+);
- Size of the primary sector (+);
- Tax and social security contributions charges; (+)
- Tax morale (-);
- Unemployment (+);

Anyway, the correlation that there is between the size of the shadow economy and productivity is endogenous, with causation going both ways (Kelmanson, 2019)

For my analysis that is related to both the shadow economy and money laundering but more with the second, an addition of variables is needed.

Indeed, as far as my method is concerned, it must be considered, as already repeated, that data of this type are not easily found since they are scarcely shared. The major databases struggle to present these data, which, even when there are, can be scarce. Because of this, some more approximated variables are considered, variables that are determinant in sizing shadow economy and Money Laundering. In my case, in addition to the data strictly related to money laundering, it is useful to use the data obtained regarding terrorism, corruption, trafficking, etc. This data is very connected to the issue of money laundering, as its source and destination because, as explained before, those phenomena are linked. In the next paragraph will be explained the choice of these indicators as other determinants.

All this, therefore, if on the side it can be useful to fill in those gaps that could not have been fixed otherwise, on the other it implies a huge work of database analysis, analysis of the data available to choose, among those, those that are better prepared for the intended purpose. Therefore, found in useful datasets, among them it is necessary to take the indicators that I am really interested in observing.

In this way, data on different countries were collected according to a choice criterion based on the states mentioned in the historical review and, especially, that they had belonged to the European Union, even if states from other geographical areas were also included: in this way I want to give a wider overview of the study and I also want to capture as many cultural aspects of every part of the world as possible, which could influence citizens' behavior.

To choose other variables, it makes sense to remind some literature review already mentioned. Subsequently, the data were grouped and sorted in a database done independently with excel. In this database, there are basically panel data, i.e. time series data combined with cross-over data.

4.2 Grounding for the approximation of the data

According to some authors, the approximations used to implement this analysis seems to be adequate. Indeed, also Schneider set that for estimating money laundering or shadow economics there wasn't an ideal or dominating method – all have serious problems and weaknesses, that is a good idea, when possible, to use several methods and, especially, it is necessary to do a lot more research regarding the estimation methodology to be used and regarding the empirical results for different countries and periods (Schneider, 2019).

Moreover, a ground of this estimations comes from the assumption that the underground economy uses cash to avoid tax burden and for illegal purposes, as according to Lombardi, so as regressors variables stating the preference for liquidity are used such as interest rate on deposits and level of the tax burden. Moreover, another aspect of the underground economy which relates more directly with the share of total crimes is coming from prostitution

and drug dealing, which is possible, so, to use it as a variable for shadow economy/money laundering (Lombardi, 2018; Barone, Delle Side & Masciandaro, 2017).

Tax evasion, such as money laundering, however, it is strongly connected, as already seen, to human trafficking and drug trade; the problem of the employment illegal immigrants in the agriculture and construction sectors, especially, derives from the availability of money. Illegal immigrant workers worldwide are around 230 million (Rogoff, 2016).

Moreover, *“migration and remittances play a dual role with respect to the shadow economy. Migrant workers, similarly to informal workers, tend to reside in rural areas, have less education, and are employed more in labor-intensive (less productive) activities compared to workers in the formal sector. The shadow economy and migration also play a similar poverty-reducing role, providing a safety net for the poor. As a result, the two phenomena can be viewed as substitute activities, and are therefore negatively related”*. (Kelmanson *et al.*, 2019: 9) Moreover, remittances and refugees can foster informality by giving capital or a safety net, pushing recipients of economic remittances to choose a job that is informal and, logically, less secure (Ivlevs, 2016). As an example, it happens in Moldova where women and young people, with family members that work in foreign countries, choose the informality rather than the formal way to work (Kelmanson *et al.*, 2019).

Therefore, migration and informality can be considered as substitutes between them also because, moreover, this pair of phenomena are determined by common factors such as weak institutions, poor human capital, and low productivity.

It seems to make sense, so, to add variables regarding refugees and illegal trafficking of people. Another indicator that can be used is government effectiveness, which has an important influence on tax morale; so, according to Kelmanson’s Working Paper of 2019, an inverse relationship exists between the size of the shadow economy and the quality of government.

Indeed, in the available previous literature, it seems that even a weak institutional quality is a determining factor. Indeed, a too high regulatory burden or a too low efficiency of government institutions, together with a weak rule of law, can participate in spreading corruption and so it can incentivize businesses enterprises from hire workers and encourage the activities considered as not legal (Kelmanson *et al.*, 2019).

So, weak governance, including corruption and weak judicial systems, has been found as very important to determine the shadow economy, in particular in the cross-relationship with regulation and some other variables. It has been verified that the effect of rules and financial constraints on informality is bigger with a better rule of the law (Dabla-Norris, et al., 2008) and with the dimension of governance exceeding certain levels (Oviedo, 2009).

Furthermore, there has been other evidence of the impact of the tax burden and of the tax administration on the shadow economy. If the set of the overall tax burden is bigger and/or the monitoring and application are smaller, so people feel more an incentive to evade tax and underestimate the salary.(Schneider & Williams; 2013, Hassan & Schneider; 2016).

Finally, it can't be left the high dependence that terrorism has from Money Laundering, indeed various are the typologies in the way this dependence work, such as the attempts to fight this financing system from dirty money to the terroristic cells (Perkel, 2004; Irwin, Choo, Liu, 2012; Gordon, 2010)

4.3 Defining variables and hypothesis

After the definition of choice of data, the databases used to collect data are chosen among the most popular databases, such as UNODC, WorldBank, Organization for Economic Co-operation and Development (OECD), Eurostat, Eurobank, Fiscal Health Index, Transparency International, etc., and among others less known; so, I built a database and a model with data on countries in the following way:

- The period considered is a 20-year time span between 2000 and 2019. However, hardly any data for a single indicator is present for all years. The indicators taken into consideration are manifold, and can alternatively assume the value of an explanatory variable, an implicit variable, and a control variable. Various control variables have been taken into consideration, such as growth, government effectiveness, etc., since I must gather as many aspects as possible that could distort my regression (see Annex A1)
- The model used to study the phenomenon is so based on MIMIC implemented with an OLS regression model, which is analyzed through the use of the GRETTL software. With this model, I want to investigate a correlation between money laundering and electronic-money. The software used to carry out the analysis, as mentioned, is GRETTL.

Through the use of information regarding money laundering, electronic money, other illicit activities, and other information on the use of cash and/or not, I want to see if a transition to the cashless society could somehow reduce money laundering and some decrease in illegal activity.

As already seen, there are several studies that favor a positive response but are often limited to a single country. With this analysis, I want to find an effect that can be considered as general

Different regression lines will be estimated, alternately using as:

i) Explanatory variable: The choice of these variables is made according to the literature review of the first chapter and with the ground of the last paragraph; so, the link that these indicators have with ML is testified by various authors:

- Corruption Perception Index, (Kelmanson *et al.*, 2019; Dabla-Norris, *et al.*, 2008)
- Government Effectiveness, (Kelmanson *et al.*, 2019; Dabla-Norris, *et al.*, 2008; Oviedo, 2009)
- log number of Arrests for terrorism (Perkel, 2004; Irwin *et al.*, 2012; Gordon, 2010)
- log number of Refugees, (Rogoff, 2016; Kelmanson *et al.*, 2019; Ivlevs, 2016)
- log unlawful Acts involving drug use or traffic. (Lombardi, 2018; Barone *et al.*, 2017).

ii) Different variables are used as dependent variables relating to the use of electronic money and online transactions, both by companies and individuals, and data concerning the possession and use of payment cards. So, the choice has been based on the indicators of what I want to observe, based on the purpose of the thesis, so the availability of firms to move toward an online market (1), the amount of cards and operations, such transfers, made with cards (2), the availability of reaching cash for people, estimated with the amount of cash machines for 100.000 people (3), the spread of electronic banking, digital wallet, etc in the population (4), and the propensity of people to E-commerce (5).

- 1 - Online sales of companies
- 2 - Number of cards
- 3 - Amount of ATM
- 4 - E-banking
- 5 E-commerce

iii) Finally, as control variables there is a difficult choice since the number is large; those that are best suited to my task are, according to the same literature review that bases the choice of dependent variables (Dittmar, 2018; Schneider & Williams; 2013, Hassan & Schneider; 2016; Rogoff, 2016): :

- Corruption
- Gini Index
- Corruption Perception Index
- Government Effectiveness
- Tax burden

In the second part, however, variables that act as explanatory can become direct variables. In analyzing whether, indeed, a push towards e-money could give a boost to economic growth, even with the help of the alleged decrease in money laundering, the latter becomes variable to explain, together with other factors such as the data just mentioned. In this second part, the only explanatory variable is economic growth, estimated to be a growth in GDP.

As already highlighted, therefore, the hypotheses on which I base myself are substantially two:

1) To an increase and enhancement of electronic money at the expense of physical cash, the recycling of the latter undergoes a proven decrease

H0: no decrease

H1: decrease

2) A boost to technological innovation in the financial sector, therefore his abandonment of cash, with its benefits, also contributes to increasing economic growth.

H0: no economic growth with technological innovation in the economy

H1: Economic growth

From these two main hypotheses, it's possible to get other hypotheses as a consequence of those two analysed more deeply:

1)

a) Support for the shift towards a cashless society also affects the international rankings of indicators such as CPI. Moreover, this shift will help the government to perform its functions more easily

b) Investments in electronic money, incentives for the use of electronic money, etc. make human trafficking and drug trafficking and the emergence of terrorist cells more difficult;

c) A state with more traceable transactions is a less corrupt state

2) a) E-money moderates the effect of ML on growth; with a decrease of ML due to the increase of E-money and the decrease of cash, it will increase economic growth.

4.4 Applying the model

After, the analysis will be implemented at different times, each time with a different dependent variable among the indicators chosen as the determinant of money laundering or shadow economy. The method is, as above, a direct approach based on the hypothesis of the MIMIC model, according to which, an unobservable variable can be estimated with those indicators seen as a determinant of that (Tekwe *et al.*, 2014; Schneider, 2019). In my work, using the Fixed Effect method for Panel data, a relation between the indicator considered as a determinant, and indicators regarding the incentives for e-money will be analyzed. Besides the theoretical ground that gives validity to the choice of variables, the determinants will be checked twice, using the OLS model, with the indicators used as approximations for "ML". One estimation checks directly the effect of the variables considered as determinants of ML on ML itself, that is, so, used as variable Y and the supposed determinants as X variables. The other one is indirect, i.e. will be checked the effect of the "cashless" indicators on ML, looking

for coherence with the effects found for variables of electronic money on the determinants of ML. These estimations will be done at the end because, singularly, don't have too much significance because of the few amounts of data directly referred to money laundering, but together, as "check" of the other regression they can get validity.

After, the analysis will focus on the effect of the combined effect of variables indicators of “cashless” and indicators of money laundering, on economic growth. The model will be the same OLS model and two estimations will be done because all the variables linked to money laundering with all those linked to cashless would be too many. The models estimated will be three different, on the base of the variables indicators of “cashless” chosen:

- The first is related to the amount of cash and cards
- The second studies the relation of economic growth with E-banking
- The third studies the relation of economic growth with E-commerce

Continuing on the path chosen for the method, so, the models are estimated using the Ordinary Least Squares (OLS) method using the GRETl software applying the Fixed Effect model. Non-negative quantitative variables are logged to take advantage of the variation instead of the stock data. Time dummy variables are inserted.

FE analyzes the relationship between the variables considered as predictors and result variables internal to the entity in question. Every entity has its own characteristics that can or can't modify the behave of predictive variables. With the use of FE it is controlled for the assumption that something inside the individual can influence or distort the predictor or the outcome variables., as its normal to think to talk about economic growth and institution. This is the basic logic of the correlation assumed between the entity's error term and its predictive variables. The FE is needed to remove the effect of the invariant characteristics over time allowing to evaluate the net effect of predictors on the result variable

Using ML/rate as a consecutive variable, the use of time dummy variables is essential, given the limited period of data available compared to the period considered in my thesis and the dummy variables of the period available will, therefore, be selected.

The analysis is so made with 5 models, using 5 different dependent variables Y:

- Corruption Perception Index (Transparency International)
- Government Effectiveness (World Bank)
- log Number of Arrests for terrorism (UNODC)
- log number of Refugees (Fiscal Health Index)
- log Unlawful Acts involving drug use or trafficking (UNODC)

The following variables X (independent) come from databases such as Eurostat and Eurosystem; the period analyzed is still 20 years, from 2000 to 2020, but each of the available data is hardly covering the full period.

- log of Enterprises selling online in the Real Estate sector
- log of Enterprises selling online in the Construction sector
- log of Ebaking and Commerce/ internet banking %of individuals
- log of Ebaking and Commerce /internet commerce %of individuals
- log of Automated Teller Machines ATMs for 100.000 inhabitants
- Growth rate in the number of card payments -growth rate in the number of credit transfers

Variables X as control variables are:

- Global Insight Country Risk (Transparency International)
- Residential property price index (Eurosystem)
- d_1_GDPpc (World Bank)
- Gdebt (World Bank)
- Tax Burden (Fiscal Health Index)
- GINI index (World Bank)
- and also some of the variables used as the Y variable.

For the second part of the analysis, d_1_GDPpc (World Bank) will be used as dependent variables, because the effect that I aim to study is on that.

The work of collecting and analyzing data has been long and hard; the data collected, also, sometimes lacked in some years; indeed, the work of approximation of the indicators has been longer than expected.

By the way, the estimation has shown information that can be considered trustful, in the proportion of the data managed to collect. The results, presented in the next chapter, can be satisfactory and in line with what the hypotheses were.

5. Empirical results

5.1 Estimations

The validity of the approximations used on-site variables of the ML variable is supported by the literature. For each regression, will be checked the single p-value for the interesting indicator and the statistical F. The determination coefficient R^2 , measures the goodness of the regression, but for these regressions, due to the amount of data available not always too big, could be high, showing a possible presence of autocorrelation; for all the cases of a very high level of R^2 or Within R^2 , the Durbin-Watson test has always shown no presence of autocorrelation.

I insist, anyway, that the validity of my analysis is not given by the single regression but from the coherent values shown from each of them.

To verify, however, a model with explanatory variable I_{ML} and variables x is first implemented, the variables that are used as an approximation. The time frame available for ML is limited, so the estimation made it is only useful to check the coherence with the results that will be obtained previously in model Check (too see all estimations, check Annexes and the end of the chapter)

It is clear that the number of refugees, for example, affects the ML rate, thus against illegal acts involving the control and use of drugs and the tax burden.

5.2 Estimation of the models

The estimation is divided into two parts, as 2 are the hypothesis that is aimed to be tested. The first concerns the relationship between ML and E-Money; the 2nd will take care of analyzing E-money and its effect moderated with ML on economic growth.

5.2.1 Part 1 of the model: impact of cashless on Money Laundering

To estimate the following model, previously estimated indicators will be selected, this time, as explanatory variables of ML; furthermore, variable illicit acts (drugs) involving the control or public dissemination of drugs (DRUGS in the model) will also be taken into consideration. This addition is made because, although the DRUG indicator has little support in the literature, although it does have one, it has shown, through statistical analysis, to be significantly correlated to ML; moreover, the sign of the correlation is the least, which means that the dependence is therefore negative, this is because an increase in reports of illegal acts concerning drugs, therefore of new arrests and/or investigations, can lead to new knowledge in the criminal field which, inter alia, could also be used to combat money laundering.

Another estimation with ML as the dependent variable will be made as a "check" that the previous findings are corrected. A coherence among all the results will be searched for.

In the first part of the model, I start by estimating the *refugee* variable with the various information available on the electronic economy, highly correlated variables both in literature and in statistical analysis, and with control variables considered in some way determinants of money laundering. According to the established hypothesis, the main purpose is to find $\beta_i=0$.

$$\begin{aligned} 2) \quad l_Refugeepopulationbycountry_{it} = & \\ & \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline_{it} + \\ & \beta_2 l_Enterprisessellingonline/Constr_{it} + \beta_3 l_Ebankingandecommerce/ \\ & E - bank_{it} + \beta_4 l_Ebankingandecommerceinte/E - comm_{it} + \\ & \beta_5 l_Automatedteller machinesATMs_{it} + \beta_6 d_L_GDPpc_{it} + \\ & \beta_7 TaxBurden_{it} + \beta_8 growthrateinnumberofcardp_{it} + \\ & \beta_9 Growthrateinnumberofcredit_{it} + \beta_{10} CPI_{it} + \beta_{11} Gdebt_{it} + \\ & \beta_{12} goveff_{it} + u_i \end{aligned}$$

From results showing in tables in annexes, it's possible to see that the p-value is low for single variables and all estimation (p-value for F-statistic), so the significance is present, although it's not considerably high. In addition, the R-framework is also high, testifying that the regression is "good".

By analyzing with ROBUST for standard errors, the following results are obtained (Annexes)

While the percentage of refugees seems to decrease for an increase of E-commerce and online activity of Real Estate sector, it seems to increase for a rise in the rate of E-banking and online activities of enterprises in the construction sector.

- 3) As a second model to estimate I choose the one with government efficiency as Y; in the literature, it has been repeatedly referred to as one of the culprits of a bad judicial system, with corruption, bribes, and with room for the spread of crimes such as money laundering.

$$\begin{aligned} goveff_{it} = & \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline/RE_{it} \\ & + \beta_2 l_Enterprisessellingonline/Constr \\ & + \beta_3 l_Ebankingandecommerce/E - bank_{it} \\ & + \beta_4 l_Ebankingandecommerceinte/E - comm \\ & + \beta_5 growthrateinnumberofcardp_{it} \\ & + \beta_6 Growthrateinnumberofcredit_{it} + \beta_7 GINIindex + \beta_8 Gdebt_{it} \\ & + \beta_9 AResidentialPropertyPriceIn_{it} + \beta_{10} TaxBurden_{it} \\ & + \beta_{11} l_Automatedteller machinesATMs_{it} + \beta_{12} CPI_{it} + u_i \end{aligned}$$

Also, in this case, the estimators of interest are significant, indicating a relationship between the explanatory variable and the x variables. Again the analysis is proposed with the use of ROBUST.

The effect of these indicators is really interesting. E-banking and E-commerce have different effects on government effectiveness; if E-banking has helped to improve the efficiency of the government, maybe allowing more people to get a bank account, even where the physic banks were absent, only using a mobile phone. In this way the amount of people with a bank account has surely increased, going to decrease the strength of unregulated transactions.

Regarding the growth of the use of cards and credit transfer, it has been shown a negative effect caused by their increase. That's against the hypothesis and the preview literature. Maybe it could show a first arrangement of criminals to the world of the digital.

- 4) Regarding arrests for terrorism, help seems given by the E-banking; this is in line, also, with the results found for government effectiveness. Moreover, also the number of ATM for 100,000 inhabitants increased the number of arrests; seems, in this way, that an incentive to cash brings to an increase of the terrorist activity

5)

$$CPI_{it} = \theta_i + \alpha_i + \beta_1 l_Ebankingandecommerce_{it}/E - comm_{it} + \beta_2 l_Enterprisessellingonline/RE_{it} + \beta_3 l_Enterprisessellingonline/Constr_{it} + \beta_4 l_Ebankingandecommerce/E - bank_{it} + \beta_5 growthrateinnumberofcardp_{it} + \beta_6 Growthrateinnumberofcredit_{it} + \beta_7 GINIindex + \beta_8 TaxBurden_{it} + \beta_9 l_Automatedteller machinesATMs_{it} + \beta_{10} AResidentialPropertyPriceIn_{it} + u_i$$

Corruption exists with money laundering, therefore it was chosen to study a model with the Corruption Perception Index as a variable Y. Again, the estimate showed interesting values and significant statistical significance.

For the Corruption Perception Index, also, it has been found a negative effect of internet banking among individuals but a positive by e-commerce, while the effect of growth in cards has been again negative. Also, ATM's spread is directly involved, and highly, with corruption. It means that the effect that directly decreases and deactivates the use of cash decrease also the corruption in the country.

$$6) l_DRUGS_{it} = \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline/RE_{it} + \beta_2 l_Enterprisessellingonline/Constr_{it} + \beta_3 l_Ebankingandecommerce/E - bank + \beta_4 l_Ebankingandecommerce_{it}/E - comm_{it} +$$

$$\beta_5 l_Automatedteller machinesATMs_{it} + \beta_6 CPI_{it} + \beta_7 goveff_{it} + \beta_8 df_l_GDPpc_{it} + \beta_9 growthrateinnumberofcardp_{it} + \beta_{10} Growthrateinnumberofcredit_{it} + u_i$$

Regarding the Unlawful acts involving drug use and traffic, results seem to be quite in line with what was expected. An increase in online activity decreases \the amount of these illegal acts. There are anyway increased by an increase in the activity of firms in the Real Estate sector and from the activity of E-commerce, and it seems clear with the spread of the drug market in the black market.

Also, the availability for cash (ATMs) shows a positive relationship with these acts; indeed use of cash increase a bit the spread of these acts, which, anyway, are increased also by the spread of cards for payments, usually also used in the drug market online.

7) CHECK

$$\begin{aligned} l_MLRate_{it} = & \theta_i + \alpha_i + \beta_1 l_Ebankingandecommerce/E - bank_{it} \\ & + \beta_2 l_Ebankingandecommerceinte/E - comm_{it} \\ & + \beta_3 l_Enterprisessellingonline/Constr_{it} \\ & + \beta_4 l_Enterprisessellingonline/RE_{it} \\ & + \beta_5 growthrateinnumberofcardp_{it} \\ & + \beta_6 Growthrateinnumberofcredit_{it} + \beta_7 GINIindex_{it} \\ & + \beta_8 l_Automatedteller machinesATMs_{it} + u_i \end{aligned}$$

With this last estimation is checked the relation also of ML with the data regarding electronic money. With this, I want to estimate directly the effect on those indicators on money laundering. It is the last estimation because data regarding money laundering are really limited and that can compromise the validity of the estimation. Anyway, the results of this estimation are in line with those found in the previous estimations and so, this one, if alone could not have, maybe, a great significance, as a "check" for the other estimation it could work. It shows, especially, results in line with those regarding refugees, trafficking of people, government effectiveness, and terrorist arrests. The results are not in line with those found with CPI and Unlawful acts involving drugs.

5.2.2 Part 2: Effect on economic growth

For the estimation of economic growth, it will be used the logarithm-1st difference-GDPpc, to give values of growth. For this estimation will be used multiplied variables to test how electronic payments moderate ML's effect on growth. So, variables about electronic payment and ML will be multiplied and the variables chosen are based on the last estimation of the first part, where it is shown the better approximations of ML with government effectiveness, trafficking of people, refugees, and terrorist arrests. The moderate with e-money effect of ML

on growth is estimated with the moderate effect of CPI on growth with growth in the number of cards; moderate effect of goveff with ATM on growth; moderate effect of refugees by ATMs on growth; moderate effect; moderate effect of goveff with E-commerce on growth; moderate effect of refugees with E-commerce on growth; The method will be the same of the first part, so there will be three analysis, each one with common X variables and some differences too, to catch all the possible behaviors of the variables studied.

- 1) $d_l_GDPpc_{it} = \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline/Constr_{it} + \beta_2 l_Ebankingandecommerce/E - bank_{it} + \beta_3 l_DRUGS_{it} + \beta_4 l_AResidentialPropertyPriceIn_{it} + \beta_5 CPIXgrowthnumbcard_{it} + \beta_6 goveffXATM_{it} + \beta_7 l_refXatm_{it} + \beta_8 goveffXecomm_{it} + \beta_9 l_EcommXref_{it} + \beta_{10} growthrateinnumberofcardp_{it} + \beta_{11} Growthrateinnumberofcredit_{it} + \beta_{12} TaxBurden_{it} + u_i$
- 2) $d_l_GDPpc_{it} = \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline/Constr_{it} + \beta_2 l_Ebankingandecommerce/E - bank_{it} + \beta_3 l_DRUGS_{it} + \beta_4 l_AResidentialPropertyPriceIn_{it} + \beta_5 CPIXgrowthnumbcard_{it} + \beta_6 goveffXATM_{it} + \beta_7 l_refXatm_{it} + \beta_8 goveffXecomm_{it} + \beta_9 l_EcommXref_{it} + \beta_{10} growthrateinnumberofcardp_{it} + \beta_{11} Growthrateinnumberofcredit_{it} + \beta_{12} TaxBurden_{it} + \beta_{12} l_ecomtodrugs_{it} + u_i$
- 3) $d_l_GDPpc_{it} = \theta_i + \alpha_i + \beta_1 l_Enterprisessellingonline/Constr_{it} + \beta_2 l_Ebankingandecommerce/E - bank_{it} + \beta_3 l_DRUGS_{it} + \beta_4 l_AResidentialPropertyPriceIn_{it} + \beta_5 CPIXgrowthnumbcard_{it} + \beta_6 goveffXATM_{it} + \beta_7 l_refXatm_{it} + \beta_8 goveffXebank_{it} + \beta_9 l_ebankXCPI_{it} + \beta_{10} growthrateinnumberofcardp_{it} + \beta_{11} Growthrateinnumberofcredit_{it} + \beta_{12} TaxBurden_{it} + \beta_{12} l_ebanktodrugs_{it} + \beta_{12} Ebankingandecommerce/E - comm_{it} + u_i$

And the hypothesis:

H0: $\beta_1=0; \beta_2=0; \beta_3=0; \beta_5=0; \beta_6=0; \beta_7=0; \beta_8=0; \beta_9=0; \beta_{10}=0; \beta_{11}=0$

H1: $\beta_1 \neq 0; \beta_2 \neq 0; \beta_3 \neq 0; \beta_5 \neq 0; \beta_6 \neq 0; \beta_7 \neq 0; \beta_8 \neq 0; \beta_9 \neq 0; \beta_{10} \neq 0; \beta_{11} \neq 0$

(F-statistic)

Added to the same hypothesis for not the whole estimations but also for the single β of interest (T-statistic)

1)

The values found to show different views but, mostly, they have a “negative” interpretation (or at least not expected); i.e., an increase of the online activities of firms in Real Estate sector brings to a decrease of growth, while an increase in the use of internet banking has an increasing effect on growth.

An increase in unlawful acts regarding the drug, increase also the growth. This could be also read as an "increase of reported acts" so translating in better effectiveness of the government and better-tracked crimes.

The moderate effect of CPI on economic growth, with growth in the number of cards, is shown significant and negative for growth; moderate effect of goveff with ATM on growth as well, so that the moderate effect of refugees by ATMs on growth. However, a moderate effect of goveff with E-commerce on growth and moderate effect of refugees with E-commerce on growth shows significant positive effects on growth.

2)

The last estimation is run once with indicators regarding E-commerce and controlled for E-banking, and once vice versa. It was found, again, an increasing effect of acts related to drugs (use and trafficking) on growth. Also, a light effect of the growth of card is present, significant but low, while is significant the moderation effect of drugs for E-commerce on growth.

For this part, the results have been found in line with what was expected but not all. Decreasing effects on growth have been found for an increase in construction enterprises' online activities and also some effects of electronic indicators moderated with those regarding ML. For example, the growth of numbers of the card has increased corruption and the overall effect is a decrease in growth; this effect is estimated in all the estimations and is also coherent because CPI has been seen as negatively correlated with economic growth. Also, the effect of an increase in cash availability, with increasing ATM, on government effectiveness would show a decrease in growth. The growth given by the increasing of cards is also proved in all the estimations. In general, by the way, if the growth seems certain regarding only indicators of electronic money, with the moderated effect it doesn't seem like that. E-commerce and E-banking seem to work well for economic growth, even if it's interesting to notice that the moderated effect of E-commerce with drug trafficking on growth is positive.

5.3 Discussion of the Results

The table 1 and table 2 synthesize the signs and the level of significance of variables of interest for the effects of cashless on Money Laundering.

Table 1 : Signs and significance of ML estimations (1)

		EntSellOn/RE	EntSellOn/Cons	E-commerce
Refugees	normal	- **	+ **	- ***
	robust	- ***	+ ***	- ***
TraffickPeople/convicted	normal	- *	+	- *
	robust	- *	+	- **
Gov/eff	normal	+	-	+ *
	robust	+	-	+ **
CPI	normal	+ **	-	+ ***
	robust	+ **	-	+ ***
Terrorism Arrest	normal			
	robust			
drugs	normal	+	- **	+
	robust	+ **	- ***	+ *
ML rate	normal	+	+	-
	robust	+	+ *	- ***

- = no significance
- * = significance 10%, p-value < 0.01 (min significance)
- ** = significance 5%, p-value < 0.05
- ***= significance 1%, p-value < 0.01 (max significance)

Table 2 : signs and significance of ML estimations (2)

	E-banking	ATMs	growthCard	GrowthCredit
Refugees	+ *	-	+	-
	+ ***	-	+	- *
TraffickPeople/convicted	-	-	-	+
	-	- ***	-	+
Gov/eff	- *	+	- *	- **
	- **	+	- ***	- **
CPI	- **	+ ***	- *	-
	- ***	+ ***	- ***	-
Terrorism Arrest	- ***	+	+	-
	- **	+	+	-
drugs	-	+ **	+	-
	-	+ *	+ ***	-
ML rate	+ *	+	+ *	+ **
	+ ***	+ ***	+ ***	+ ***

- = no significance
- * = significance 10%, p-value < 0.01 (min significance)
- ** = significance 5%, p-value < 0.05
- ***= significance 1%, p-value < 0.01 (max significance)

The work of collecting and analyzing data has been long and hard; the data collected, also, sometimes lacked in some years; indeed, the work of approximation of the indicators has been longer than expected.

By the way, the estimation has shown information that can be considered trustful, in the proportion of the data managed to collect. The results can be satisfactory and in line with what the hypotheses were.

Particularly important were the values assumed by the estimators in the regression equation which related the different determinants of money laundering or the shadow economy; very often, the estimates were characterized by very small p-values, evidence of a relationship of statistical relevance between the two observations.

Talking more specifically, a high significance was found with almost all the variables of interest, even if not always coherent. For example, for refugees it was found evidence for both enterprises selling online and e-commerce/internet banking; by the way, if for E-banking it was a positive relationship, for e-commerce was negative. It means that, while the percentage of refugees seems to decrease for an increase of E-commerce and online activity of the Real Estate sector, it seems to increase for a rise in the rate of E-banking and online activities of enterprises in the construction sector. The construction sector has been often involved, especially in the developing parts of the world but not only, in the use of refugees and immigrants for their work. An increase in the number of refugees due to the increase of online trade of firms in the construction sector could mean the involvement of enterprises in cyber-crime or also the so-called "transaction laundering",

The same has been found for the estimation that had "government effectiveness" as a dependent variable. Moreover, it's interesting to see that here a high significance has been found for the rate of cards for inhabitant and rate for credit transfer, but this significance is related to a negative correlation. It means that the effectiveness of the government has decreased with the growth of these two data. The effect of these indicators is really interesting. E-banking and E-commerce have different effects on government effectiveness; E-banking has helped to improve the efficiency of the government, maybe allowing more people to get a bank account, even where the physic banks were absent, only using a mobile phone. In this way the amount of people with a bank account has surely increased, going to decrease the strength of unregulated transactions. E-commerce, by the way, involves also business in the dark market.

Regarding the growth of the use of cards and credit transfer, it has been shown a negative effect caused by their increase. That's against the hypothesis and the preview literature. Maybe it could show the first arrangement of criminals to the world of the digital

With Corruption Perception Index as Y variable, indeed, the results are really satisfying; for E-commerce and online trade by Real Estate firms, the relationship is positive, i.e. it is shown an increase of CPI with the increase of these two indicators. Anyway, Real Estate is a sector historically related to ML activities and corruption, and E-commerce as well. By the way, an increase of E-banking is related to a decrease of Corruption, indeed it makes

higher the number of tracked transactions; E-banking is connected to the inverse effect of the growth of the number of cards to CPI.

Also, clear evidence is given by the incentive to use cash (ATM for 100,000 inhabitants) to a push up of the perception of Corruption.

Regarding arrests for terrorism, really help seems given by the E-banking; this is in line, also, with the results found for government effectiveness. Moreover, also the number of ATM for 100,000 inhabitants increased the number of arrests; seems, in this way, that inventiveness to cash brings to an increase of the terrorist activity

Regarding the unlawful acts connected to drugs, they seem to decrease with an increase of transaction system of the construction sector, moving toward an online market, while it seems to increase with the increase of the number of ATM (cash) and with the E-commerce; it's useful to remind that E-shop of the market are really diffused on Dark Web but also in the clear one, like in social networks such as Instagram or Telegram, and on of their function, often, is the one of recycling money.

The estimation with ML helps to check if the values found in the other estimations are trustful, and it seems especially for estimations with refugees, trafficking of people, government effectiveness, and rate of terrorist arrests.

From the annexes, it's possible to check the significance of each estimation in its integrity with the low p-value of F-statistic.

The table 3 synthesizes the signs and the level of significance of variables of interest for the effect of cashless on economic growth, considering both direct and indirect (moderated with money laundering) effect

Table 3 : signs and significance of growth estimations

	1 estimation of Growth		2 estimation of growth		3 estimation of growth	
	Norm	robust	norm	robust	norm	robust
selling Online/CON	- **	- ***	- **	- ***	-	- **
SellingOnline/RE			- *	- *		
E-banking	+ **	+ **	+	+ **		
E-commerce					+ *	+ ***
ATM			-	-	-	-
Growthofcards	+ ***	+ ***	+	+ *	+	+ *
GrowthofCT	+ **	+ ***	+	+	+	+
Drugs	+ **	+ ***	+ *	+ **	+	+ **
CPI						
E-bankXDrug					+	+
E-BankXCPI					+	+
E-bankingtoGoveff	+				+	+ *
E-commtoDrug			+	+ ***		
E-commtoGoveff	+		+	+		
E-commtoRef	+ *		-	-		
CPIXgrowthofcards	- ***	- ***	-	- **	- *	- **
ATMtoGoveff	- **	- ***	-	- **	-	- ***
ATMtoRef	- *	- ***	+	+	+	+

- = no significance
- * = significance 10%, p-value < 0.01 (min significance)
- ** = significance 5%, p-value < 0.05
- ***= significance 1%, p-value < 0.01 (max significance)

For the 2nd part, the one about the effect of Money Laundering/cashless on growth, the results have been found in line with what was expected. Decreasing effects on growth have been found for an increase in construction enterprises' online activities and also some effects of electronic indicators moderated with those regarding ML. For example, the growth of the numbers of the card has increased corruption and the overall effect is a little decrease in growth for values smaller than 0.00001. Also, the effect of an increase in cash availability, with increasing ATM, on government effectiveness would show a decrease in growth. In the same way is moderated the effect of ATM with refugees, because it still negative and significant.

In line with the previous part, the effect of E-commerce on growth moderated by government effectiveness shows an increase in growth. The same with the moderated effect with refugees, of E-commerce, on growth.

The effect of growth cards and growth of credit transfer is increasing the growth, but being $CPI \times Growthcards < 0$, it means that the negative effect of CPI is stronger than the positive given by the growth of cards in the payment system.

Regarding enterprises that started to sell online, negative effects have been tested for growth.

The F-statistics is significant at a level of 99% for the 1st estimation of economic growth, and at a level of 95% for the others.

6. Conclusions

Technological improvements definitely involved the area of economy and finance. Merchants of all kinds saw the opportunities arising from these new developments and seem they want to move to reach new richness. The same satisfaction, anyway, has not been found for who each day fights against illicit activity its consequences such as Money Laundering and Shadow Economy. A certain level of intrusting has been found on the new digital payment systems and new developments arisen, also from the criminal side, for the usage of these new items. In this way also, outcomes on the Economy and the criminal activity of money laundering are uncertain but, anyway, probably not so positive as expected.

As a first conclusion, it seems right to think that the improvement of use E-commerce doesn't increase Money Laundering, but it can decrease it. This effect has been used to test the effect of the increase in the rate of E-commerce activity for % individuals. For all the estimations the results were coherent, E-commerce has always shown a decreasing significant effect on the variables Y considered. It was found with an increasing effect for CPI that, by the way, somehow had a decreasing effect on ML.

The effect on unlawful acts involving drugs doesn't seem to have a decreasing power. Anyway, as I said already, E-commerce is used also for drug dealing. Anyway, an increasingly significant effect is shown only with a robust estimation. Anyway, this could be interpreted as an improvement of crime detection; in this way, the value would be coherent, or at least not in contrast, with those found in the other estimations.

The overall effect can be considered valid; also, the last check with ML estimation has been coherent. Also, the increase of the shift toward and online market from the Real Estate sector seems to give results similar to those of E-commerce and overall coherent in the same way. I.e., the effect is showing as decreasing all the determinants to which the relation is significant, expect, exactly like for E-commerce, for CPI. The Real Estate sector, indeed, has always been a sector for launderers to infiltrate, so a transition to a more regulated payment system should decrease the problem given by suspicious transactions.

E-bank had shown, in the various estimations, coherence as well. The relationship with ML seems to be, anyway, the opposite of the one observed by E-commerce. Indeed, an increased effect on that seems to exist. Anyway, often digital wallet and E-bank let do money transfers also to who doesn't have a digital account; anyway, the E-banking has been found influencing negatively government effectiveness and the number of arrests related with terrorism. Anyway, this banking activity is quite new and is still not such regulated like real banking. Anyway, the effect could be read also as "fewer arrests for terrorism means that with E-banking, a terrorist cell can connect with more difficulties. However, the negative relation of

an increase of E-banking activity on government effectiveness and the increasing relation with the number of refugees (besides that with ML) suggest that this is not the case.

This can be related to the observation consequent of the findings for the growth of the number of cards per inhabitant and the growth of the number of credit transfers. Indeed, and it's quite interesting, the growth of these two indicators seems related to the growth of Money Laundering. Anyway, in the literature, especially from payments reports, it was found how credit and debit card, especially prepaid, are mostly instruments through which illegal money move because some give (especially in the USA) a certain grade of anonymity. So, credit or debit cards, maybe even related to E-banking accounts, showed a significant decrease in government effectiveness. Moreover, with the opposite relation with CPI, it is also confirmed the increasing relation with ML. The growth of the number of credit transfer has not been found significant, even if the direction of the results is still in line with results found with growth of the number of cards and E-banking.

The number of ATMs for 100,000 inhabitants has been used to test the spread of cash and incentive to use it: more ATMs give more availability of liquidity and facilitate the wish to "withdraw" money. It has been found, anyway, that an increase of ATMs for 100,000 inhabitants relates to a decrease in the number of people convicted for illegal trafficking of people. Due to the other results, it seems that an increase of availability of cash has only negative consequences: increase the trafficking of drugs, increase the perception of corruption and decrease the traceability of smugglers of illegal immigrants; that can be translated in a, even if not too much accurate, increase of ML rate.

The value regarding the construction enterprises selling online is ambiguous; indeed, even if is shown as really significant an increase on the number of refugees due to the increase of online activity of these enterprises, that seems in line with the literature that found high use of immigrants and refugees in the labor-intense sectors of the economy, such as agriculture and constructions.

The other results seem not clear and especially are without significance. It was found a non-clear relation between the increase of construction enterprises selling online and the decrease of the acts involving drugs. Anyway, the effect on ML is seen as "increasing", but not so significant; this result is also coherent with those found with other estimations; checking the signs of the values, indeed, they seem to have a direction that is coherent with the sign found on the estimation with money laundering, that is positive but probably not statistically significant.

Taking a general picture, therefore, the effect of the increase in money and electronic transactions to the detriment of those carried out using circulating money does not seem to have the desired results at all. What seems clear, however, and in line with the expectations suggested by the literature, is that the number of cash actually creates money laundering problems, the

underground economy, and illegal activities in general. Although not all values were statistically different from 0, the signs were always the expected ones. So, at first glance, a move to a cashless society could suggest a decrease in illegal activities. However, this is closely linked to the money factor, which is still the preferred tool for illicit transactions.

As for online commerce activities, online banks, the online market of different companies, and the use of payment cards, this is not yet certain but seems to go towards a little effect of these new methods, as regards the recycling of money. In fact, the only indicator that seems to be increasing the ML is growing, is E-commerce; moreover, even a transition to online activities of companies operating in the construction sector would not create an increase in money laundering but seems more oriented in the opposite direction.

E-banking activity, with the spread of payment cards, would seem to increase money laundering. It was talked about money mules, which play a fundamental role in new developments in money laundering in the age of technology. Furthermore, money transfers are also possible to non-bank account holders; in Portugal, for example, MBway is an application connected to Multibanco, the Portuguese bank, which allows the transfer of money by passing a code that can be entered, in any Multibank counter, by anyone who can, therefore, perform the withdrawal of money without a trace.

However, even for E-commerce, the result can be contingent. It has been said that money laundering tool, if not criminals of all kinds, is circulating money. While it is true that in a moment of "trial" and "transition" towards a cashless society, money is discouraged in favor of electronic money, the working capital continues to be present in all respects. An analysis should be more appropriate in the future, when new scenarios are available and the cash, at least in some realities, has actually been eliminated. Transaction Laundering, in fact, is a phenomenon that has already begun and can only exploit the new technological opportunities that will come to be more efficient and "safe", since these will be the needs of criminals if the cash were to fail.

After all, money laundering, or the underground economy, obviously exists together with money and together with it evolves, just as the whole economy, history, society evolves. In general, so, I don't feel to say that a transition to a cashless society would decrease the amount of money laundered. Or, as already said, if the decrease of physic cash could, especially in a short time, decrease and deficit the amount of money laundered, such as the amount of crimes related to that, an increase of electronics and technology could also give new opportunities to criminals.

As for the second part of my analysis, that is the effect, both moderate and not from money laundering, of the transition to the cashless society on economic growth.

In this case, the conclusion is more immediate. Indeed, the results found were, first of all, consistent with those found in the first part of the analysis. In fact, E-commerce, in general, seems to not damage economic growth. Its effect, moderate with the key indicators of money laundering, doesn't decrease it, but, even if not significant, it shows positive values. There is a need to be careful, however: surely the amount of transactions has increased thanks to this opportunity, transactions that are more easily traceable on the one hand, therefore with positive outcomes for both ML and economic growth. But this world opens new scenarios, of crimes carried out not only in the dark web but also in the light one.

In the other estimations, conclusions are more interesting. In fact, the results found were, first of all, consistent with those found in the first part of the analysis. In fact, E-commerce, in general, seems to bring results that encourage economic growth, but this works only not taking into consideration the moderation of ML indicators. What is immediately to notice is that the growth in the number of payment cards would have a positive effect on growth, but this effect is not only canceled but even reversed if moderate with CPI; in fact, CPI has been noted as positively related to economic growth, that is, incredibly, an increase in this would lead to an increase in the economy. This result is consistent and consistent with other CPI interaction variable results.

As for the other values, in general, I found what would be expected from a decrease in cash: fewer ATMs increase economic growth and this factor is not particularly moderated by the efficiency of the government which is not affected too much by this indicator. E-banking, on the other hand, decreases government capacity but this effect is less than that caused by online banking alone. This demonstrates a great help to the economy given by this factor, since, despite the interference given by a new world like that of E-banking, the "advantages" are already greater than the "disadvantages". As for E-commerce, this has increased drug trafficking activity, and economic growth has been affected! In fact, both the increase in the number of acts relating to drugs and the increase in E-commerce brings benefits. It remains to be clarified whether these acts are considered to be reported and reported because they are intercepted, so in this case, it would be easier for E-commerce to track illegal purchases online, or, conversely, this would only be an effect probably due to the increase in online trading activity. Anyway, always it's important to be careful, however: surely the amount of transactions has increased thanks to this opportunity, transactions that are more easily traceable on the one hand, therefore with positive outcomes for both ML and economic growth. But this world opens new scenarios, of crimes carried out not only in the dark web but also in the light one. The growth in the number of cards also shows growth in the economy. However, as seen previously, the growth of payment cards also increases the perceived Corruption index, thus leading to a downturn in the economy.

Finally, it is fundamental to analyse the results regarding the effects moderated by government effectiveness and refugees for the ATM. In fact, it is clearly evident that an increase in the possibilities of using physical money has negative effects as regards the efficiency of the government, which decreases, the number of refugees, which increases, thus leading to a decrease in the economy.

As a general consideration, anyway, it would seem that a transition to the cashless society would benefit the economy, but, the effect moderated with money laundering is not so positive. Be that as it may, the effect of policies that encourage electronic commerce activities and that discourage the use of cash, not considering the consequences that lead to ML indicators, lead to a general growth in the economy. This would seem, above all, to be a consequence more of the disappearance of cash than of a settlement of electronic money. Be that as it may, the effect of policies that encourage electronic commerce activities and that discourage the use of cash, with the consequences that lead to ML indicators, lead to a general growth in the economy. Anyway, a significant effect of abandoning cash moderated with the increase of government effectiveness or the decreasing effect on refugees will increase economic growth.

The effect moderated by ML indicators seems, always, to decrease the expected effect that a transition to a cashless society has. This, considering the quite good effects seen for ML, could be explained with a part of GDP guided by the illegal economy.

As already mentioned, the validity of this work is obtained by making the most of the amount of data available which, perhaps, would not have been very significant for a single analysis. With this evidence, my work aims to suggest an economic vision of the fight against the underground economy and money laundering. In general, this step would seem to bring benefits to the economy. As for the effect on money laundering, my expectations have also been quite fulfilled. A deeper analysis, however, could confirm what is suggested by this thesis. In fact, this work lacked since the beginning of a consistent amount of data for the phenomenon that I wanted to observe, but approaching in this method I could minimize this lack. Of course, anyway, problems of autocorrelation could arise but the Durbin-Watson test was always showing no presence of that. But this model could be limited in the “mechanic” way to implement it. Obviously, a higher number of data would allow a different and more specific analysis, but this thesis must be the basis for future analysis of the topic. For example, a simple test with another model of these.

So, according to these results, the benefits deriving from the transition to a cashless society arises mostly from the abandoning of physic cash than from an increase of electronic market and payment system. This could suggest a short-term effect of a decrease of money, because, being it still the most spread payment system in the world, a disincentive to the use of

that could decrease the amount of money laundered that, still, is made mostly through cash. But new developments, new technology, a new era will increase the need of adaption from criminals who could, in the beginning, suffer a decrease of the use of cash but could, also, with time, arrange to use new sources and destination of illegal funds, even when they are not in a “paper” form. This could explain, also, why the moderated effect of electronic money with money laundering doesn’t seem to have big implications on economic growth; anyway, abandoning cash in favor to a more technological society where payments are implemented by phones or other electronic items, seems to have good implications on growth, especially moving from cash to cards. For what concerns the new ways such as E-bank and E-commerce, it seems to help the economy to increase, even if the effect is not maybe so significant and not strong, because, among all, also of the nature of these methods that are new and so difficult. Or, maybe, their effect could be moderated by the endogenous effect that was found for money laundering: so, an increase of online payments, wallets, etc, doesn’t seem to have great implications on money laundering, because even if there is coherence among estimations, some variables seem to push ML up while some to decrease it. This effect, especially when is increasing ML, could have effects on economic growth as well that, if from one side it takes benefits from the spread of electronic transactions, from the other side it’s harmed by the possible increase of money laundering activity and the shadow economy.

Moreover, right now it’s possible that a new technology revolution is going to bring substantial developments; the Covid-19 pandemic has forced almost the whole world at home, implementing what is called Smart-Working, even where, perhaps, there were still not all the necessary tools and regulations. In Italy, some companies have in fact used smart working to exploit employees and pocket the redundancy funds (Repubblica.it, 2020). Anyway, it has to be noted that, the recent pandemic crisis has and will certainly harm the global volume of world trade, but certainly, as is already happening, it will give a further strong boost to all forms of electronic commerce and cash dematerialization worldwide. All of these most recent facts could have irreversibly changed the world; if the transition to a cashless society seems now closer but not easy, a general push on technology seems instead the next future. It seems so long time ago when everything was still normal and computers, such as smartphones, tablets, were, for someone at least, were not more than useful instruments to make daily life easier. But now people is “stick” to computer more than ever, and the risks are always present. In order to really test the validity of the thesis, and so, of the model, an *a posteriori* estimation would be interesting; by the way, a transition to an electronic payment system, right now, could not have the expected hoped results. Even if it seems close, indeed, a lot of countries are starting to face a new economic crisis. So, a “revolution” like that, in a moment like this, could bring everywhere.

Technological developments (Cyber Security Intelligence, 2018) therefore, are now at the window and criminals everywhere where they are ready to exploit their opportunities. Believing that money laundering can die with electronic money still seems like a fairy-tale and would be interesting also to see if even during the pandemic crisis and in the next economic crisis, the activities of recycling money increased or decreased or if they just “shifted”.

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Annexes

Table 4 : A1 Database

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
	Country	Year	GDP	Pop	registri	Enterpris	Enterpris	E-bankin	E-bankin	CPI	Global In	World J	Residen	Basel AI	Electron	Automa	Growth	growth	growth	ML/Cle	ML/Cou	ML/Rat	Fr/Cou	Fr/Rat	SE/Cou	SE/R
45	Denmark	2003	56191																							
46	Denmark	2004	56257																							
47	Denmark	2005	57609																							
48	Denmark	2006	56793																							
49	Denmark	2007	60853																							
50	Denmark	2008	61175																							
51	Denmark	2009	60905																							
52	Denmark	2010	57229																							
53	Denmark	2011	60041																							
54	Denmark	2012	59576																							
55	Denmark	2013	59459																							
56	Denmark	2014	58788																							
57	Denmark	2015	59438																							
58	Denmark	2016	59968																							
59	Denmark	2017	60670																							
60	Denmark	2018																								
61	Denmark	2019																								
62	Sweden	2000	44694																							
63	Sweden	2001	45271																							
64	Sweden	2002																								
65	Sweden	2003	46059																							
66	Sweden	2004	46363																							
67	Sweden	2005	48821																							
68	Sweden	2006	49986																							
69	Sweden	2007	52046																							
70	Sweden	2008	53421																							
71	Sweden	2009	52711																							
72	Sweden	2010	49554																							
73	Sweden	2011	52076																							
74	Sweden	2012	52062																							
75	Sweden	2013	52520																							
76	Sweden	2014	52723																							
77	Sweden	2015	52662																							
78	Sweden	2016	55395																							
79	Sweden	2017	56473																							
80	Sweden	2018																								
81	Sweden	2019																								
82	Portugal	2000	21513																							

Table 5 : A.2 Model 0

Pooled OLS, using 20 observations
 Estimations: Unlawful acts = DRUGS
 Model 0: Pooled OLS, using 20 observations
 Included 5 cross-sectional units
 Time-series length = 4
 Dependent variable: l_MLRate

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	42.2764	5.42143	7.798	<0.0001	***
dt_14	-2.73864	1.00320	-2.730	0.0196	**
dt_15	-2.85545	0.991089	-2.881	0.0149	**
dt_16	-1.31733	0.896439	-1.470	0.1697	
CPI	-0.145849	0.0744798	-1.958	0.0760	*
goveff	3.00869	2.61957	1.149	0.2751	
l_Refugeepopulation	4.02294	0.959837	4.191	0.0015	***
bycountryo					
l_Unlawfulactsinvol	-2.11681	0.572993	-3.694	0.0035	***
vingcontro					
TaxBurden	-0.407631	0.0632305	-6.447	<0.0001	***
Mean dependent var	2.833827	S.D. dependent var		1.909399	
Sum squared resid	8.851495	S.E. of regression		0.897040	
R-squared	0.872218	Adjusted R-squared		0.779286	
F(8, 11)	9.385510	P-value(F)		0.000597	
Log-likelihood	-20.22731	Akaike criterion		58.45462	
Schwarz criterion	67.41621	Hannan-Quinn		60.20402	
rho	-0.643597	Durbin-Watson		2.314421	

White's test for heteroskedasticity -

Null hypothesis: heteroskedasticity not present

Test statistic: LM = 12.295

with p-value = $P(\text{Chi-square}(13) > 12.295) = 0.503616$

Table 6 : A.3 Model 1

Fixed-effects, using 27 observations
Included 8 cross-sectional units
Time-series length: minimum 2, maximum 5
Dependent variable: l_Refugeepopulationbycountryo

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	36.0303	13.6636	2.637	0.0779	*
l_Enterprisessellingo nline/RE	-0.995173	0.301409	-3.302	0.0457	**
l_Enterprisessellingo nline/Constr	3.58433	0.854067	4.197	0.0247	**
l_Ebankingandecom merce/E-bank	5.43818	2.11856	2.567	0.0827	*
l_Ebankingandecom merceinte/E-comm	-13.3826	3.09602	-4.323	0.0228	**
l_Automatedtellerma chinesATMs	-1.90368	2.55911	-0.7439	0.5109	
d_l_GDPpc	8.29342	7.55069	1.098	0.3523	
TaxBurden	-0.241040	0.0756468	-3.186	0.0498	**
growthrateinnumber ofcardp	7.47130e-06	1.32890e-05	0.5622	0.6132	
Growthrateinnumber ofcredit	-1.91053e-05	1.78292e-05	-1.072	0.3625	
dt_12	-5.53299	1.40489	-3.938	0.0292	**
dt_14	-2.22915	0.670208	-3.326	0.0449	**
dt_15	-0.775258	0.402309	-1.927	0.1496	
dt_16	-0.807280	0.326216	-2.475	0.0897	*
CPI	0.257154	0.0914131	2.813	0.0671	*
Gdebt	-0.0579721	0.0251799	-2.302	0.1048	
goveff	0.685663	2.00063	0.3427	0.7544	
Mean dependent var	3.402498	S.D. dependent var		1.737259	
Sum squared resid	0.150656	S.E. of regression		0.224095	
LSDV R-squared	0.998080	Within R-squared		0.975124	
LSDV F(23, 3)	67.80725	P-value(F)		0.002517	
Log-likelihood	31.73470	Akaike criterion		-15.46941	
Schwarz criterion	15.63068	Hannan-Quinn		-6.221720	
rho	-0.727659	Durbin-Watson		2.733285	

Joint test on named regressors -

Test statistic: $F(16, 3) = 7.34979$

with p-value = $P(F(16, 3) > 7.34979) = 0.0629373$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(7, 3) = 25.8084$

with p-value = $P(F(7, 3) > 25.8084) = 0.0110659$

Table 7 : A.4 Model 1a

Fixed-effects, using 27 observations					
Included 8 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: l_Refugeepopulationbycountryo					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	36.0303	6.34302	5.680	0.0008	***
l_Enterprisessellingo nline/RE	-0.995173	0.181155	-5.493	0.0009	***
l_Enterprisessellingo nline/Constr	3.58433	0.358739	9.991	<0.0001	***
l_Ebankingandecom merce/E-bank	5.43818	1.17151	4.642	0.0024	***
l_Ebankingandecom merceinte/E-comm	-13.3826	1.12772	-11.87	<0.0001	***
l_Automatedtellerma chinesATMs	-1.90368	1.23099	-1.546	0.1659	
d_l_GDPpc	8.29342	2.35943	3.515	0.0098	***
TaxBurden	-0.241040	0.0283140	-8.513	<0.0001	***
growthrateinnumber ofcardp	7.47130e-06	9.04241e-06	0.8263	0.4359	
Growthrateinnumber ofcredit	-1.91053e-05	8.81198e-06	-2.168	0.0668	*
dt_12	-5.53299	0.521936	-10.60	<0.0001	***
dt_14	-2.22915	0.240023	-9.287	<0.0001	***
dt_15	-0.775258	0.168154	-4.610	0.0025	***
dt_16	-0.807280	0.213151	-3.787	0.0068	***
CPI	0.257154	0.0301720	8.523	<0.0001	***
Gdebt	-0.0579721	0.0154746	-3.746	0.0072	***
goveff	0.685663	0.870268	0.7879	0.4566	
Mean dependent var	3.402498	S.D. dependent var		1.737259	
Sum squared resid	0.150656	S.E. of regression		0.224095	
LSDV R-squared	0.998080	Within R-squared		0.975124	
Log-likelihood	31.73470	Akaike criterion		-15.46941	
Schwarz criterion	15.63068	Hannan-Quinn		-6.221720	
rho	-0.727659	Durbin-Watson		2.733285	

Joint test on named regressors -

Test statistic: $F(16, 7) = 30.6978$

with $p\text{-value} = P(F(16, 7) > 30.6978) = 6.18214e-005$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 5.7) = 0.832604$

with $p\text{-value} = P(F(7, 5.7) > 0.832604) = 0.598124$

Table 8 : A.5 Model 1b

Fixed-effects, using 26 observations					
Included 8 cross-sectional units					
Time-series length: minimum 1, maximum 5					
Dependent variable: l_TPpeopleconvicted					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-21.2976	22.0633	-0.9653	0.4056	
l_Automatedtellerma chinesATMs	-4.37339	1.99042	-2.197	0.1155	
CPI	0.131961	0.0345469	3.820	0.0316	**
growthrateinnumber ofcardp	-1.56477e-05	2.25631e-05	-0.6935	0.5379	
Growthrateinnumber ofcredit	7.31233e-07	1.07173e-05	0.06823	0.9499	
l_Enterprisessellingo nline/RE	-0.586882	0.244551	-2.400	0.0959	*
l_Enterprisessellingo nline/Constr	0.324618	0.338475	0.9591	0.4083	
l_Ebankingandecom merce/E-bank	-0.791135	1.66080	-0.4764	0.6664	
l_Ebankingandecom merceinte/E-comm	-4.62211	1.54883	-2.984	0.0584	*
goveff	1.27030	2.22896	0.5699	0.6086	
l_Unlawfulactsinvol vingcontro	4.82020	2.40631	2.003	0.1389	
l_AResidentialPrope rtyPriceIn	1.24945	2.17464	0.5746	0.6058	
dt_12	-2.11635	0.728104	-2.907	0.0622	*
dt_14	-1.16587	0.607102	-1.920	0.1506	
dt_15	-1.37270	0.649663	-2.113	0.1250	
dt_16	-1.28762	0.333243	-3.864	0.0307	**
Mean dependent var	2.925577	S.D. dependent var		1.475714	
Sum squared resid	0.086379	S.E. of regression		0.169685	
LSDV R-squared	0.998413	Within R-squared		0.976609	
LSDV F(22, 3)	85.81124	P-value(F)		0.001776	
Log-likelihood	37.29997	Akaike criterion		-28.59993	
Schwarz criterion	0.336290	Hannan-Quinn		-20.26735	
rho	-0.344138	Durbin-Watson		2.186181	

Joint test on named regressors -

Test statistic: $F(11, 3) = 6.26566$

with p-value = $P(F(11, 3) > 6.26566) = 0.0787269$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(7, 3) = 34.3563$

with p-value = $P(F(7, 3) > 34.3563) = 0.0072929$

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(4) = 27.4162
with p-value = 1.6376e-005

Table 9 : A.6 Model 1c

Fixed-effects, using 26 observations					
Included 8 cross-sectional units					
Time-series length: minimum 1, maximum 5					
Dependent variable: l_TPpeopleconvicted					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-21.2976	23.5697	-0.9036	0.3962	
l_Automatedtellerma chinesATMs	-4.37339	0.600477	-7.283	0.0002	***
CPI	0.131961	0.0271495	4.861	0.0018	***
growthrateinnumber ofcardp	-1.56477e-05	1.80938e-05	-0.8648	0.4158	
Growthrateinnumber ofcredit	7.31233e-07	9.12035e-06	0.08018	0.9383	
l_Enterprisessellingo nline/RE	-0.586882	0.276306	-2.124	0.0713	*
l_Enterprisessellingo nline/Constr	0.324618	0.254252	1.277	0.2424	
l_Ebankingandecom merce/E-bank	-0.791135	1.12210	-0.7050	0.5036	
l_Ebankingandecom merceinte/E-comm	-4.62211	1.37158	-3.370	0.0119	**
goveff	1.27030	1.18539	1.072	0.3194	
l_Unlawfulactsinvol vingcontro	4.82020	2.56199	1.881	0.1020	
l_AResidentialPrope rtyPriceIn	1.24945	0.972024	1.285	0.2395	
dt_12	-2.11635	0.600277	-3.526	0.0097	***
dt_14	-1.16587	0.529364	-2.202	0.0635	*
dt_15	-1.37270	0.673726	-2.037	0.0810	*
dt_16	-1.28762	0.339017	-3.798	0.0067	***
Mean dependent var	2.925577	S.D. dependent var		1.475714	
Sum squared resid	0.086379	S.E. of regression		0.169685	
LSDV R-squared	0.998413	Within R-squared		0.976609	
Log-likelihood	37.29997	Akaike criterion		-28.59993	
Schwarz criterion	0.336290	Hannan-Quinn		-20.26735	
rho	-0.344138	Durbin-Watson		2.186181	

Joint test on named regressors -

Test statistic: $F(11, 7) = 1184.1$

with p-value = $P(F(11, 7) > 1184.1) = 2.37407e-010$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 9.0) = 0.604434$

with p-value = $P(F(7, 9.0) > 0.604434) = 0.740267$

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(4) = 189.172

with p-value = 7.98444e-040

Table 10 : A.7 Model 2

Fixed-effects, using 32 observations
Included 9 cross-sectional units
Time-series length: minimum 2, maximum 5
Dependent variable: **goveff**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0.132421	2.17386	0.06092	0.9531	
l_Ebankingandecom merceinte/E-comm	0.844457	0.360348	2.343	0.0516	*
l_Enterprisessellingo nline/RE	0.0564855	0.0495569	1.140	0.2919	
l_Enterprisessellingo nline/Constr	-0.0802021	0.0852867	-0.9404	0.3783	
l_Ebankingandecom merce/E-bank	-0.988006	0.476922	-2.072	0.0770	*
dt_12	0.0517669	0.133411	0.3880	0.7095	
dt_14	-0.0796993	0.0783742	-1.017	0.3430	
dt_15	-0.0908339	0.0750809	-1.210	0.2656	
dt_16	0.0259294	0.0584140	0.4439	0.6705	
growthrateinnumber ofcardp	-9.62205e-06	4.37401e-06	-2.200	0.0637	*
Growthrateinnumber ofcredit	-6.08807e-06	2.48068e-06	-2.454	0.0438	**
GINIindex	0.0780843	0.0434063	1.799	0.1151	
Gdebt	-0.0120878	0.00342762	-3.527	0.0096	***
AResidentialPropert yPriceIn	-0.00729051	0.00347031	-2.101	0.0738	*
TaxBurden	0.0109766	0.00974692	1.126	0.2972	
l_Automatedtellerma chinesATMs	0.732846	0.495476	1.479	0.1827	
CPI	-0.0318471	0.0207595	-1.534	0.1689	
Mean dependent var	1.548411	S.D. dependent var		0.357590	
Sum squared resid	0.030363	S.E. of regression		0.065860	
LSDV R-squared	0.992340	Within R-squared		0.930841	
LSDV F(24, 7)	37.78675	P-value(F)		0.000027	
Log-likelihood	65.95837	Akaike criterion		-81.91673	
Schwarz criterion	-45.27333	Hannan-Quinn		-69.77048	
rho	-0.413165	Durbin-Watson		2.231796	

Joint test on named regressors -

Test statistic: $F(16, 7) = 5.88852$

with p-value = $P(F(16, 7) > 5.88852) = 0.0120335$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(8, 7) = 3.26592$

with p-value = $P(F(8, 7) > 3.26592) = 0.068273$

Table 11 : A.8 Model 2a

Fixed-effects, using 32 observations					
Included 9 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: goveff					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0.132421	1.89722	0.06980	0.9461	
l_Ebankingandecom merceinte/E-comm	0.844457	0.280974	3.005	0.0169	**
l_Enterprisessellingo nline/RE	0.0564855	0.0462005	1.223	0.2563	
l_Enterprisessellingo nline/Constr	-0.0802021	0.0569550	-1.408	0.1967	
l_Ebankingandecom merce/E-bank	-0.988006	0.365973	-2.700	0.0271	**
dt_12	0.0517669	0.123024	0.4208	0.6850	
dt_14	-0.0796993	0.0266995	-2.985	0.0175	**
dt_15	-0.0908339	0.0289042	-3.143	0.0138	**
dt_16	0.0259294	0.0527053	0.4920	0.6360	
growthrateinnumber ofcardp	-9.62205e-06	2.24667e-06	-4.283	0.0027	***
Growthrateinnumber ofcredit	-6.08807e-06	2.59668e-06	-2.345	0.0471	**
GINIindex	0.0780843	0.0521012	1.499	0.1723	
AResidentialPropert yPriceIn	-0.00729051	0.00156251	-4.666	0.0016	***
TaxBurden	0.0109766	0.00835909	1.313	0.2255	
l_Automatedtellerma chinesATMs	0.732846	0.591027	1.240	0.2501	
Gdebt	-0.0120878	0.00269163	-4.491	0.0020	***
CPI	-0.0318471	0.0269756	-1.181	0.2717	
Mean dependent var	1.548411	S.D. dependent var		0.357590	
Sum squared resid	0.030363	S.E. of regression		0.065860	
LSDV R-squared	0.992340	Within R-squared		0.930841	
Log-likelihood	65.95837	Akaike criterion		-81.91673	
Schwarz criterion	-45.27333	Hannan-Quinn		-69.77048	
rho	-0.413165	Durbin-Watson		2.231796	

Joint test on named regressors -

Test statistic: $F(16, 8) = 60.2431$

with p-value = $P(F(16, 8) > 60.2431) = 1.44656e-006$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(8, 7.0) = 0.659121$

with p-value = $P(F(8, 7.0) > 0.659121) = 0.71499$

Table 12 : A.9 Model 3

Fixed-effects, using 42 observations
Included 6 cross-sectional units
Time-series length: minimum 2, maximum 13
Dependent variable: l_ARRESTS

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	27.5657	10.3820	2.655	0.0161	**
l_Automatedtellerma chinesATMs	1.24297	2.28586	0.5438	0.5933	
growthrateinnumber ofcardp	2.88059e-05	4.38515e-05	0.6569	0.5196	
Growthrateinnumber ofcredit	-1.44434e-05	2.76215e-05	-0.5229	0.6074	
dt_8	-3.29095	1.72056	-1.913	0.0718	*
dt_9	-4.22021	1.46773	-2.875	0.0101	**
dt_10	-4.13705	1.51735	-2.726	0.0138	**
dt_11	-2.07282	1.39328	-1.488	0.1541	
dt_12	-2.05682	1.30196	-1.580	0.1316	
dt_13	-1.71060	1.31714	-1.299	0.2104	
dt_14	-2.39250	1.29195	-1.852	0.0805	*
dt_15	-1.65013	1.10856	-1.489	0.1539	
dt_16	-0.600024	1.18033	-0.5084	0.6174	
dt_17	-0.144272	0.954775	-0.1511	0.8816	
dt_18	0.339773	0.894253	0.3800	0.7084	
CPI	-0.0198198	0.0283046	-0.7002	0.4927	
l_Ebankingandecom merce/E-bank	-6.69235	2.24657	-2.979	0.0080	***
dt_7	-4.03346	1.74036	-2.318	0.0324	**
AResidentialPropert yPriceIn	-0.00809203	0.0279530	-0.2895	0.7755	
Mean dependent var	2.126299	S.D. dependent var		1.258548	
Sum squared resid	11.51184	S.E. of regression		0.799717	
LSDV R-squared	0.822736	Within R-squared		0.663648	
LSDV F(23, 18)	3.632317	P-value(F)		0.003558	
Log-likelihood	-32.41526	Akaike criterion		112.8305	
Schwarz criterion	154.5346	Hannan-Quinn		128.1167	
rho	-0.531261	Durbin-Watson		2.306035	

Joint test on named regressors -

Test statistic: $F(18, 18) = 1.97308$

with p-value = $P(F(18, 18) > 1.97308) = 0.0794742$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(5, 18) = 9.30255$

with p-value = $P(F(5, 18) > 9.30255) = 0.000163899$

Table 13 : A.10 Model 3a

Fixed-effects, using 42 observations					
Included 6 cross-sectional units					
Time-series length: minimum 2, maximum 13					
Dependent variable: l_ARRESTS					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	29.8371	6.00062	4.972	0.0042	***
l_Automatedtellerma chinesATMs	1.21035	1.92852	0.6276	0.5578	
growthrateinnumber ofcardp	2.74733e-05	1.87013e-05	1.469	0.2018	
Growthrateinnumber ofcredit	-1.47112e-05	2.64455e-05	-0.5563	0.6020	
CPI	-0.0208663	0.00918428	-2.272	0.0723	*
l_Ebankingandecom merce/E-bank	-6.73109	2.23488	-3.012	0.0297	**
l_AResidentialPrope rtyPriceIn	-0.594312	1.13196	-0.5250	0.6220	
dt_11	-2.02172	1.01417	-1.993	0.1028	
dt_12	-2.00018	1.28334	-1.559	0.1798	
dt_13	-1.65134	1.15187	-1.434	0.2111	
dt_14	-2.32140	1.06112	-2.188	0.0803	*
dt_15	-1.59764	1.16651	-1.370	0.2291	
dt_16	-0.538511	1.23862	-0.4348	0.6819	
dt_17	-0.104844	0.867596	-0.1208	0.9085	
dt_18	0.365030	1.03946	0.3512	0.7398	
dt_7	-3.99293	1.12496	-3.549	0.0164	**
dt_8	-3.26495	1.39150	-2.346	0.0659	*
dt_9	-4.20244	1.13398	-3.706	0.0139	**
dt_10	-4.07554	1.11696	-3.649	0.0148	**
Mean dependent var	2.126299	S.D. dependent var		1.258548	
Sum squared resid	11.53758	S.E. of regression		0.800610	
LSDV R-squared	0.822339	Within R-squared		0.662896	
Log-likelihood	-32.46216	Akaike criterion		112.9243	
Schwarz criterion	154.6284	Hannan-Quinn		128.2105	
rho	-0.538473	Durbin-Watson		2.321495	

Joint test on named regressors -

Test statistic: $F(14, 5) = 3.4672$

with p-value = $P(F(14, 5) > 3.4672) = 0.0884187$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(5, 5.5) = 4.02888$

with p-value = $P(F(5, 5.5) > 4.02888) = 0.0667389$

Wald joint test on time dummies -

Null hypothesis: No time effects

Asymptotic test statistic: Chi-square(4) = 154.845

with p-value = 1.86348e-032

Table 14 : A.11 Model 4

Fixed-effects, using 37 observations
Included 9 cross-sectional units
Time-series length: minimum 2, maximum 6
Dependent variable: CPI

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-37.0766	27.4550	-1.350	0.1999	
l_Ebankingandecom merceinte/E-comm	16.1406	3.07636	5.247	0.0002	***
l_Enterprisessellingo nline/RE	1.74023	0.597872	2.911	0.0122	**
l_Enterprisessellingo nline/Constr	-0.661369	1.05808	-0.6251	0.5427	
l_Ebankingandecom merce/E-bank	-15.4785	5.66575	-2.732	0.0171	**
dt_12	3.99605	2.07678	1.924	0.0765	*
dt_14	0.962639	1.58749	0.6064	0.5547	
dt_15	0.0201143	1.40173	0.01435	0.9888	
dt_16	1.42121	1.24662	1.140	0.2748	
dt_17	0.405236	0.829131	0.4887	0.6332	
growthrateinnumber ofcardp	-0.000109127	5.13418e-05	-2.126	0.0533	*
Growthrateinnumber ofcredit	-3.97041e-05	2.94760e-05	-1.347	0.2010	
GINIindex	1.42412	0.406863	3.500	0.0039	***
TaxBurden	0.188049	0.116798	1.610	0.1314	
l_Automatedtellerma chinesATMs	15.3338	4.47897	3.424	0.0045	***
AResidentialPropert yPriceIn	-0.0843724	0.0444054	-1.900	0.0798	*
Mean dependent var	76.83784	S.D. dependent var		12.82254	
Sum squared resid	14.83293	S.E. of regression		1.068173	
LSDV R-squared	0.997494	Within R-squared		0.940806	
LSDV F(23, 13)	224.9828	P-value(F)		1.94e-13	
Log-likelihood	-35.59046	Akaike criterion		119.1809	
Schwarz criterion	157.8430	Hannan-Quinn		132.8111	
rho	-0.249451	Durbin-Watson		1.995790	

Joint test on named regressors -

Test statistic: $F(15, 13) = 13.7746$

with p-value = $P(F(15, 13) > 13.7746) = 1.32297e-005$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(8, 13) = 13.3161$

with p-value = $P(F(8, 13) > 13.3161) = 4.09619e-005$

Table 15 : A.12 Model 4a

Fixed-effects, using 37 observations					
Included 9 cross-sectional units					
Time-series length: minimum 2, maximum 6					
Dependent variable: CPI					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-37.0766	15.8419	-2.340	0.0474	**
l_Ebankingandecom merceinte/E-comm	16.1406	3.23854	4.984	0.0011	***
l_Enterprisessellingo nline/RE	1.74023	0.571665	3.044	0.0160	**
l_Enterprisessellingo nline/Constr	-0.661369	0.674736	-0.9802	0.3557	
l_Ebankingandecom merce/E-bank	-15.4785	4.43693	-3.489	0.0082	***
dt_12	3.99605	1.58179	2.526	0.0355	**
dt_14	0.962639	0.768140	1.253	0.2455	
dt_15	0.0201143	0.590606	0.03406	0.9737	
dt_16	1.42121	0.935214	1.520	0.1671	
dt_17	0.405236	1.02501	0.3954	0.7029	
growthrateinnumber ofcardp	-0.000109127	2.60966e-05	-4.182	0.0031	***
Growthrateinnumber ofcredit	-3.97041e-05	2.60548e-05	-1.524	0.1660	
GINIndex	1.42412	0.562770	2.531	0.0352	**
TaxBurden	0.188049	0.0932857	2.016	0.0786	*
l_Automatedtellerma chinesATMs	15.3338	3.46617	4.424	0.0022	***
AResidentialPropert yPriceIn	-0.0843724	0.0203216	-4.152	0.0032	***
Mean dependent var	76.83784	S.D. dependent var		12.82254	
Sum squared resid	14.83293	S.E. of regression		1.068173	
LSDV R-squared	0.997494	Within R-squared		0.940806	
Log-likelihood	-35.59046	Akaike criterion		119.1809	
Schwarz criterion	157.8430	Hannan-Quinn		132.8111	
rho	-0.249451	Durbin-Watson		1.995790	

Joint test on named regressors -

Test statistic: $F(15, 8) = 75.4684$

with p-value = $P(F(15, 8) > 75.4684) = 6.19444e-007$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(8, 8.8) = 1.11757$

with p-value = $P(F(8, 8.8) > 1.11757) = 0.433781$

Table 16 : A.13 Model 5

Fixed-effects, using 33 observations					
Included 9 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: l_Unlawfulactsinvolvingcontro					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	5.96156	1.67239	3.565	0.0051	***
l_Enterprisessellingo nlineat	0.0691130	0.0393606	1.756	0.1096	
l_Enterprisessellingo nline/Constr	-0.177417	0.0730217	-2.430	0.0355	**
l_Ebankingandecom merce/E-bank	-0.313527	0.387617	-0.8089	0.4374	
l_Ebankingandecom merceinte/E-comm	0.508114	0.311772	1.630	0.1342	
l_Automatedtellerma chinesATMs	0.959044	0.368264	2.604	0.0263	**
CPI	-0.00729626	0.00967623	-0.7540	0.4682	
goveff	-0.342145	0.199745	-1.713	0.1175	
d_l_GDPpc	-0.537602	1.34554	-0.3995	0.6979	
dt_12	0.0524103	0.106586	0.4917	0.6335	
dt_14	0.0271041	0.0691127	0.3922	0.7032	
dt_15	0.101266	0.0621295	1.630	0.1342	
dt_16	0.0594325	0.0506040	1.174	0.2674	
growthrateinnumber ofcardp	5.02742e-06	3.17478e-06	1.584	0.1444	
Growthrateinnumber ofcredit	-4.00275e-08	2.22547e-06	-0.01799	0.9860	
Mean dependent var	9.548329	S.D. dependent var	1.708291		
Sum squared resid	0.040945	S.E. of regression	0.063988		
LSDV R-squared	0.999562	Within R-squared	0.731527		
LSDV F(22, 10)	1036.244	P-value(F)	4.85e-14		
Log-likelihood	63.59367	Akaike criterion	-81.18734		
Schwarz criterion	-46.76766	Hannan-Quinn	-69.60616		
rho	-0.401888	Durbin-Watson	1.549720		

Joint test on named regressors -

Test statistic: $F(14, 10) = 1.94626$

with p-value = $P(F(14, 10) > 1.94626) = 0.146462$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(8, 10) = 462.328$

with p-value = $P(F(8, 10) > 462.328) = 7.92857e-012$

Table 17 : A.14 Model 5a

Fixed-effects, using 33 observations					
Included 9 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: l_Unlawfulactsinvolvingcontro					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	5.96156	1.73434	3.437	0.0089	***
l_Enterprisessellingo nlineat	0.0691130	0.0288005	2.400	0.0432	**
l_Enterprisessellingo nline/Constr	-0.177417	0.0385109	-4.607	0.0017	***
l_Ebankingandecom merce/E-bank	-0.313527	0.237122	-1.322	0.2226	
l_Ebankingandecom merceinte/E-comm	0.508114	0.236467	2.149	0.0639	*
l_Automatedtellerma chinesATMs	0.959044	0.488349	1.964	0.0851	*
CPI	-0.00729626	0.0100314	-0.7273	0.4878	
goveff	-0.342145	0.254309	-1.345	0.2154	
d_l_GDPpc	-0.537602	1.41065	-0.3811	0.7130	
dt_12	0.0524103	0.0948941	0.5523	0.5958	
dt_14	0.0271041	0.0544394	0.4979	0.6320	
dt_15	0.101266	0.0509535	1.987	0.0821	*
dt_16	0.0594325	0.0504046	1.179	0.2722	
growthrateinnumber ofcardp	5.02742e-06	1.36642e-06	3.679	0.0062	***
Growthrateinnumber ofcredit	-4.00275e-08	1.80748e-06	-0.02215	0.9829	
Mean dependent var	9.548329	S.D. dependent var		1.708291	
Sum squared resid	0.040945	S.E. of regression		0.063988	
LSDV R-squared	0.999562	Within R-squared		0.731527	
Log-likelihood	63.59367	Akaike criterion		-81.18734	
Schwarz criterion	-46.76766	Hannan-Quinn		-69.60616	
rho	-0.401888	Durbin-Watson		1.549720	

Joint test on named regressors -

Test statistic: $F(14, 8) = 9.84986$

with p-value = $P(F(14, 8) > 9.84986) = 0.00145235$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(8, 8.3) = 1.61069$

with p-value = $P(F(8, 8.3) > 1.61069) = 0.254485$

Table 18 : A.15 Model 6 CHECK

Fixed-effects, using 19 observations
Included 6 cross-sectional units
Time-series length: minimum 2, maximum 4
Dependent variable: l_MLRate

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-311.606	97.3896	-3.200	0.0854	*
l_Ebankingandecom merce/E-bank	58.1964	18.1951	3.198	0.0854	*
l_Ebankingandecom merceinte/E-comm	-14.1944	5.93251	-2.393	0.1391	
l_Enterprisessellingo nline/Constr	1.53504	1.18384	1.297	0.3242	
l_Enterprisessellingo nline/RE	1.21314	0.679521	1.785	0.2161	
dt_14	1.14863	1.56911	0.7320	0.5403	
dt_15	1.55028	1.35215	1.147	0.3702	
dt_16	2.43076	0.968046	2.511	0.1287	
growthrateinnumber ofcardp	0.00114774	0.000290074	3.957	0.0583	*
Growthrateinnumber ofcredit	0.000248853	5.49672e-05	4.527	0.0455	**
GINIndex	-0.0399507	0.528334	-0.07562	0.9466	
l_Automatedtellerma chinesATMs	26.0845	12.5827	2.073	0.1739	
Mean dependent var	2.181806	S.D. dependent var		1.727134	
Sum squared resid	0.977061	S.E. of regression		0.698950	
LSDV R-squared	0.981803	Within R-squared		0.951336	
LSDV F(16, 2)	6.744302	P-value(F)		0.136634	
Log-likelihood	1.232793	Akaike criterion		31.53441	
Schwarz criterion	47.58988	Hannan-Quinn		34.25164	
rho	-0.534871	Durbin-Watson		1.702062	

Joint test on named regressors -

Test statistic: $F(11, 2) = 3.5544$

with p-value = $P(F(11, 2) > 3.5544) = 0.239958$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(5, 2) = 5.49137$

with p-value = $P(F(5, 2) > 5.49137) = 0.161195$

Table 19 : A.16 Model 6 CHECKb

Fixed-effects, using 19 observations					
Included 6 cross-sectional units					
Time-series length: minimum 2, maximum 4					
Dependent variable: l_MLRate					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-311.606	52.0970	-5.981	0.0019	***
l_Ebankingandecom merce/E-bank	58.1964	13.6540	4.262	0.0080	***
l_Ebankingandecom merceinte/E-comm	-14.1944	3.48909	-4.068	0.0097	***
l_Enterprisessellingo nline/Constr	1.53504	0.686691	2.235	0.0756	*
l_Enterprisessellingo nline/RE	1.21314	0.629372	1.928	0.1118	
dt_14	1.14863	0.638196	1.800	0.1318	
dt_15	1.55028	0.783986	1.977	0.1049	
dt_16	2.43076	0.418528	5.808	0.0021	***
growthrateinnumber ofcardp	0.00114774	0.000129805	8.842	0.0003	***
Growthrateinnumber ofcredit	0.000248853	2.61348e-05	9.522	0.0002	***
GINIndex	-0.0399507	0.431784	-0.09252	0.9299	
l_Automatedtellerma chinesATMs	26.0845	5.87837	4.437	0.0068	***
Mean dependent var	2.181806	S.D. dependent var		1.727134	
Sum squared resid	0.977061	S.E. of regression		0.698950	
LSDV R-squared	0.981803	Within R-squared		0.951336	
Log-likelihood	1.232793	Akaike criterion		31.53441	
Schwarz criterion	47.58988	Hannan-Quinn		34.25164	
rho	-0.534871	Durbin-Watson		1.702062	

Joint test on named regressors -

Test statistic: $F(11, 5) = 28.4453$

with p-value = $P(F(11, 5) > 28.4453) = 0.000854401$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(5, 4.0) = 0.193588$

with p-value = $P(F(5, 4.0) > 0.193588) = 0.949392$

Table 20 : A.17 Model 7

Fixed-effects, using 31 observations
Included 8 cross-sectional units
Time-series length: minimum 2, maximum 5
Dependent variable: d_l_GDPpc

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.14230	0.891455	-3.525	0.0097	***
l_Enterprisessellingo nline/Constr	-0.0290929	0.0107375	-2.709	0.0302	**
l_Ebankingandecom merce/E-bank	0.158902	0.0503186	3.158	0.0160	**
l_DRUGS	0.175867	0.0674001	2.609	0.0349	**
l_AResidentialPrope rtyPriceIn	0.127887	0.0607587	2.105	0.0733	*
CPIXgrowthnumbca rd	-2.65940e-07	7.14013e-08	-3.725	0.0074	***
goveffXATM	-0.000938738	0.000325152	-2.887	0.0234	**
l_refXatm	-0.0751725	0.0384321	-1.956	0.0914	*
dt_12	0.137288	0.0391693	3.505	0.0099	***
dt_14	0.0520300	0.0236758	2.198	0.0640	*
dt_15	0.0261947	0.0171718	1.525	0.1710	
dt_16	0.0286077	0.0123169	2.323	0.0532	*
goveffXecomm	0.000888096	0.000658949	1.348	0.2197	
l_EcommXref	0.0906328	0.0412791	2.196	0.0641	*
growthrateinnumber ofcardp	1.95465e-05	5.56536e-06	3.512	0.0098	***
Growthrateinnumber ofcredit	9.61206e-07	3.98725e-07	2.411	0.0467	**
TaxBurden	0.00413193	0.00135206	3.056	0.0184	**
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000474	S.E. of regression		0.008226	
LSDV R-squared	0.963329	Within R-squared		0.925237	
LSDV F(23, 7)	7.995149	P-value(F)		0.004399	
Log-likelihood	127.8916	Akaike criterion		-207.7831	
Schwarz criterion	-173.3674	Hannan-Quinn		-196.5645	
rho	-0.299432	Durbin-Watson		1.672684	

Joint test on named regressors -

Test statistic: $F(16, 7) = 5.41435$

with p-value = $P(F(16, 7) > 5.41435) = 0.0153133$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(7, 7) = 2.89818$

with p-value = $P(F(7, 7) > 2.89818) = 0.0918564$

Table 21 : A.18 Model 7a

Fixed-effects, using 31 observations					
Included 8 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: d_l_GDPpc					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.14230	0.793504	-3.960	0.0055	***
l_Enterprisessellingo nline/Constr	-0.0290929	0.00726334	-4.005	0.0052	***
l_Ebankingandecom merce/E-bank	0.158902	0.0458535	3.465	0.0105	**
l_Unlawfulactsinvol vingcontro	0.175867	0.0417660	4.211	0.0040	***
l_AResidentialPrope rtyPriceIn	0.127887	0.0420499	3.041	0.0188	**
CPIXgrowthnumbca rd	-2.65940e-07	5.19980e-08	-5.114	0.0014	***
goveffXATM	-0.000938738	0.000154874	-6.061	0.0005	***
l_refXatm	-0.0751725	0.0211998	-3.546	0.0094	***
dt_12	0.137288	0.0339460	4.044	0.0049	***
dt_14	0.0520300	0.0227520	2.287	0.0561	*
dt_15	0.0261947	0.0168061	1.559	0.1630	
dt_16	0.0286077	0.0114266	2.504	0.0408	**
goveffXecomm	0.000888096	0.000646606	1.373	0.2120	
l_EcommXref	0.0906328	0.0247851	3.657	0.0081	***
growthrateinnumber ofcardp	1.95465e-05	3.86597e-06	5.056	0.0015	***
Growthrateinnumber ofcredit	9.61206e-07	3.96667e-07	2.423	0.0459	**
TaxBurden	0.00413193	0.00127002	3.253	0.0140	**
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000474	S.E. of regression		0.008226	
LSDV R-squared	0.963329	Within R-squared		0.925237	
Log-likelihood	127.8916	Akaike criterion		-207.7831	
Schwarz criterion	-173.3674	Hannan-Quinn		-196.5645	
rho	-0.299432	Durbin-Watson		1.672684	

Joint test on named regressors -

Test statistic: $F(16, 7) = 2.76755$

with p-value = $P(F(16, 7) > 2.76755) = 0.0883464$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 7.6) = 0.0320106$

with p-value = $P(F(7, 7.6) > 0.0320106) = 0.999913$

Table 22 : A.19 Model 8

Fixed-effects, using 31 observations
Included 8 cross-sectional units
Time-series length: minimum 2, maximum 5
Dependent variable: d_l_GDPpc

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.05935	1.03782	-2.948	0.0320	**
dt_12	0.159650	0.0437208	3.652	0.0147	**
dt_14	0.0608697	0.0263885	2.307	0.0692	*
dt_15	0.0181315	0.0197244	0.9192	0.4001	
dt_16	0.0320676	0.0137230	2.337	0.0666	*
l_Unlawfulactsinvol vingcontro	0.138719	0.0661095	2.098	0.0899	*
l_AResidentialPrope rtyPriceIn	0.133324	0.0804761	1.657	0.1585	
TaxBurden	0.00420586	0.00150610	2.793	0.0383	**
l_Automatedtellerma chinesATMs	-0.0364058	0.0877288	-0.4150	0.6954	
growthrateinnumber ofcardp	1.16836e-05	7.13384e-06	1.638	0.1624	
Growthrateinnumber ofcredit	3.20961e-07	5.66733e-07	0.5663	0.5956	
atmtogoveff	-0.0410043	0.0283231	-1.448	0.2074	
CPIXgrowthnumbca rd	-1.74839e-07	8.78570e-08	-1.990	0.1032	
l_refXatm	0.00393868	0.00693205	0.5682	0.5945	
l_Enterprisessellingo nlineConstr	-0.0342619	0.0122090	-2.806	0.0377	**
EcommDrug	0.0235174	0.0129106	1.822	0.1282	
ecomtogoveff	0.0119163	0.0397100	0.3001	0.7762	
l_ecommxl_ref	-0.00251496	0.00676885	-0.3715	0.7255	
l_E-commerce	0.0955564	0.0594592	1.607	0.1689	
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000353	S.E. of regression		0.008398	
LSDV R-squared	0.972698	Within R-squared		0.944337	
LSDV F(25, 5)	7.125433	P-value(F)		0.018866	
Log-likelihood	132.4642	Akaike criterion		-212.9285	
Schwarz criterion	-175.6448	Hannan-Quinn		-200.7749	
rho	-0.423441	Durbin-Watson		1.798387	

Joint test on named regressors -

Test statistic: $F(18, 5) = 4.71261$

with p-value = $P(F(18, 5) > 4.71261) = 0.0471263$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(7, 5) = 2.49851$

with p-value = $P(F(7, 5) > 2.49851) = 0.165323$

Table 23 : A.20 Model 8a

Fixed-effects, using 31 observations					
Included 8 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: d_l_GDPpc					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.05935	0.592830	-5.161	0.0013	***
dt_12	0.159650	0.0274051	5.826	0.0006	***
dt_14	0.0608697	0.0124926	4.872	0.0018	***
dt_15	0.0181315	0.0125803	1.441	0.1927	
dt_16	0.0320676	0.00848264	3.780	0.0069	***
l_Unlawfulactsinvol vingcontro	0.138719	0.0439885	3.154	0.0161	**
l_AResidentialPrope rtyPriceIn	0.133324	0.0346650	3.846	0.0063	***
TaxBurden	0.00420586	0.000862911	4.874	0.0018	***
l_Automatedtellerma chinesATMs	-0.0364058	0.0360024	-1.011	0.3456	
growthrateinnumber ofcardp	1.16836e-05	5.51264e-06	2.119	0.0718	*
Growthrateinnumber ofcredit	3.20961e-07	4.59464e-07	0.6986	0.5074	
atmtogoveff	-0.0410043	0.0152970	-2.681	0.0315	**
CPIXgrowthnumbca rd	-1.74839e-07	7.21759e-08	-2.422	0.0459	**
l_refXatm	0.00393868	0.00407958	0.9655	0.3665	
l_Enterprisessellingo nline1	-0.0342619	0.00820267	-4.177	0.0042	***
EcommDrug	0.0235174	0.00660503	3.561	0.0092	***
ecomtogoveff	0.0119163	0.0269503	0.4422	0.6717	
l_ecommxl_ref	-0.00251496	0.00435290	-0.5778	0.5815	
l_Ebankingandecom merceinter	0.0955564	0.0322138	2.966	0.0209	**
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000353	S.E. of regression		0.008398	
LSDV R-squared	0.972698	Within R-squared		0.944337	
Log-likelihood	132.4642	Akaike criterion		-212.9285	
Schwarz criterion	-175.6448	Hannan-Quinn		-200.7749	
rho	-0.423441	Durbin-Watson		1.798387	

Joint test on named regressors -

Test statistic: $F(18, 7) = 3.831$

with $p\text{-value} = P(F(18, 7) > 3.831) = 0.0385811$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 7.1) = 0.325177$

with $p\text{-value} = P(F(7, 7.1) > 0.325177) = 0.919652$

Table 24 : A.21 Model 8b

Fixed-effects, using 31 observations
Included 8 cross-sectional units
Time-series length: minimum 2, maximum 5
Dependent variable: d_l_GDPpc

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.29035	1.39431	-2.360	0.0648	*
dt_12	0.153659	0.0495694	3.100	0.0269	**
dt_14	0.0621962	0.0309415	2.010	0.1006	
dt_15	0.0263864	0.0227298	1.161	0.2981	
dt_16	0.0328963	0.0163427	2.013	0.1003	
l_Unlawfulactsinvol vingcontro	0.164773	0.0940068	1.753	0.1400	
l_AResidentialPrope rtyPriceIn	0.182553	0.0914151	1.997	0.1023	
TaxBurden	0.00307829	0.00155312	1.982	0.1043	
l_Automatedtellerma chinesATMs	-0.0349321	0.102066	-0.3423	0.7461	
growthrateinnumber ofcardp	1.53548e-05	8.07128e-06	1.902	0.1155	
Growthrateinnumber ofcredit	6.52256e-07	6.91288e-07	0.9435	0.3887	
atmtogoveff	-0.0470464	0.0393175	-1.197	0.2851	
CPIXgrowthnumbca rd	-2.19388e-07	1.00964e-07	-2.173	0.0818	*
l_refXatm	0.00184446	0.00233539	0.7898	0.4654	
l_Enterprisessellingo nline1	-0.0268678	0.0135268	-1.986	0.1037	
l_Ebankingandecom merceintel	0.152031	0.0733288	2.073	0.0929	*
Ebankdrug	0.00996376	0.00778637	1.280	0.2568	
ebanktocpi	0.000169471	0.000457180	0.3707	0.7261	
ebanktogoveff	0.0236712	0.0476137	0.4972	0.6402	
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000388	S.E. of regression		0.008806	
LSDV R-squared	0.969985	Within R-squared		0.938806	
LSDV F(25, 5)	6.463248	P-value(F)		0.023381	
Log-likelihood	130.9957	Akaike criterion		-209.9914	
Schwarz criterion	-172.7077	Hannan-Quinn		-197.8378	
rho	-0.575393	Durbin-Watson		2.218958	

Joint test on named regressors -

Test statistic: $F(18, 5) = 4.26151$

with p-value = $P(F(18, 5) > 4.26151) = 0.0578391$

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: $F(7, 5) = 2.00649$

with p-value = $P(F(7, 5) > 2.00649) = 0.230343$

Table 25 : A.22 Model 8c

Fixed-effects, using 31 observations					
Included 8 cross-sectional units					
Time-series length: minimum 2, maximum 5					
Dependent variable: d_l_GDPpc					
Robust (HAC) standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-3.29035	0.903655	-3.641	0.0083	***
dt_12	0.153659	0.0367149	4.185	0.0041	***
dt_14	0.0621962	0.0217187	2.864	0.0242	**
dt_15	0.0263864	0.0164596	1.603	0.1529	
dt_16	0.0328963	0.0111488	2.951	0.0214	**
l_Unlawfulactsinvol	0.164773	0.0690656	2.386	0.0485	**
vingcontro					
l_AResidentialPrope	0.182553	0.0508442	3.590	0.0089	***
rtyPriceIn					
TaxBurden	0.00307829	0.00133592	2.304	0.0546	*
l_Automatedtellerma	-0.0349321	0.0287848	-1.214	0.2643	
chinesATMs					
growthrateinnumber	1.53548e-05	7.31822e-06	2.098	0.0741	*
ofcardp					
Growthrateinnumber	6.52256e-07	5.15070e-07	1.266	0.2459	
ofcredit					
atmtogoveff	-0.0470464	0.00871076	-5.401	0.0010	***
CPIXgrowthnumbca	-2.19388e-07	8.87029e-08	-2.473	0.0426	**
rd					
l_refXatm	0.00184446	0.00181221	1.018	0.3427	
l_Enterprisessellingo	-0.0268678	0.0100610	-2.671	0.0320	**
nline1					
l_Ebankingandecom	0.152031	0.0390600	3.892	0.0060	***
merceintel					
Ebankdrug	0.00996376	0.00534523	1.864	0.1046	
ebanktocpi	0.000169471	0.000246270	0.6881	0.5135	
ebanktogoveff	0.0236712	0.0122627	1.930	0.0949	*
Mean dependent var	0.012649	S.D. dependent var		0.020750	
Sum squared resid	0.000388	S.E. of regression		0.008806	
LSDV R-squared	0.969985	Within R-squared		0.938806	
Log-likelihood	130.9957	Akaike criterion		-209.9914	
Schwarz criterion	-172.7077	Hannan-Quinn		-197.8378	
rho	-0.575393	Durbin-Watson		2.218958	

Joint test on named regressors -

Test statistic: $F(18, 7) = 7.83406$

with p-value = $P(F(18, 7) > 7.83406) = 0.00498401$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(7, 8.1) = 0.0307878$

with p-value = $P(F(7, 8.1) > 0.0307878) = 0.999927$